University of Alberta

Factors Affecting New Music Learning of Young Suzuki Violinists

by

Elizabeth Jones Cherwick

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Education.

Department of Educational Psychology

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Factors Affecting New Music Learning of Young Suzuki Violinists submittedby Elizabeth Jones Cherwick in partial fulfillment of the requirements for the degree of Master of Education.

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Dr. J. H. Bisanz

Dr. A. P. Montgomery

Date: 30/9/96

For

Brian and Maria

and also to my greatest teachers ...

Mom, Dad

and Suzuki-Sensei

Abstract

This study examined the learning processes of 20 young violinists as they memorized two short test pieces (TPs) that contained both familiar (C) and unfamiliar (D) musical components. It was suggested that previously learned pieces (PLPs) represent a musical knowledge base upon which children build new skills. Videotaped performances of the TPs and two PLPs were evaluated by experts using error counts (OECs) and overall musical ratings (OMRs). Practice strategies consistent with previous practice literature were evident across age groups and several practice trends were described. Correlational analyses were done with OECs, OMRs and background information from a questionnaire. Expected relationships between PLP and TP performance scores were not clearly indicated in the statistical data. Error analyses provided strong evidence of advance listening effects on acquisition and suggested cognitive interference caused by the changes to the familiar component. Children with the highest performance scores tended to have the lowest practice times and vice versa. T-tests indicated that there were not significant differences from the first to final performances of each piece, indicating that practicing ceased to be effective after the first 6 minutes.

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CHAPTER 1

The Psychology of Music: Background

The field of music psychology has developed considerably in the last few decades, but it continues to be plagued by a diversity which thwarts the systematic development of a consistent line of investigation (Hargreaves, 1986). Perhaps the only consensus among researchers in this eclectic field is that there is an urgent need for both new and replicative research (Fiske, 1992; Hargreaves, 1986; Hedden, 1987; Scott-Kassner, 1992; Weerts, 1992). The drive to define musical thought and to understand the psychoacoustic process has traditionally channeled a great deal of research energy into the areas of music listening and perception (Baily, 1985; Davies, 1978; DeNardo & Kantorski, 1996; Deutsch, 1982; Radocy & Boyle, 1988; Serafine, 1988; Sloboda, 1988; Tighe & Dowling, 1993). This research has been conducted primarily with adults, and there has been a particular penchant for participants without musical experience (Hargreaves, 1986; Hargreaves & Zimmerman, 1992). Furthermore, the tasks presented in most perception studies were hardly recognizable as meaningful music, prompting a call for more ecologically valid music research (Clarke, 1985; DeNardo & Kantorski, 1996; Serafine, 1988). In contrast, the limited research done with instrumentalists has often examined the elite category of professional musicians and focussed on topics such as musical interpretation, decision making, or performance preparation (Hallam, 1995; Mursell, 1971; Shaffer, 1981; Winhold, Thelen, & Ulrich, 1994). Although I am in agreement with the sentiments of Davidson and Scripp (1992), who commented "Because of the comprehensiveness of the expert's perspective and skills, it is necessary to base research and investigation squarely in the center of expert's practice as well as musical practice" (p. 398), the work with experts must center on the more fundamental aspects of their playing if it is to inform the music

educator. It could be argued that children cannot reach the level of musical interpretation without first learning how to hold the instrument and play the notes.

For more than half of this century a great deal of emphasis was placed on musical aptitude testing. Seashore's (1919) work epitomized the convictions of his day that musical ability was an inborn trait that needed to be identified in advance of training. An interest in defining and measuring musical ability or aptitude continues to exist but has been balanced with attempts to define how musical ability develops in all children (Hargreaves, 1986; Howe, Davidson, Moore, & Sloboda; 1995; Nelson, Barresi, & Barrett, 1992; Radocy & Boyle, 1988; Shuter-Dyson & Gabriel, 1981). As interest has shifted towards providing music for all children, research in recent decades has been conducted in the music classroom where there are large numbers of available participants (Miller, 1986; Scott-Kassner; 1992; Weerts, 1992). Classroom studies have been necessarily limited to questions that deal with school-age children with limited musical background. Many studies that have sought to examine the effects of musical training have been limited by school-term deadlines. Consequently, training studies have often focussed on short-term training effects (Flohr, 1981; Hair, 1973; Ramsey, 1983; Schleuter & Schleuter, 1989; Scott-Kassner, 1992).

The lack of theoretical consensus in music psychology and its resulting plethora of isolated research interests make it difficult even to begin formulating an approach to investigating the cognitive processes of young instrumentalists. The confusion that faces a newcomer to the field is perhaps best illustrated with the organization of the Handbook of Research on Music Teaching and Learning (Colwell, 1992). Separate chapters have been designated for "Structure of Cognition and Music Decision-Making," "Surveying the Coordinates of Cognitive Skills in Music," "Developmental Theories of Music Learning," and "Research in Early Childhood Education." Although there was some overlap in the material the

authors presented, there was, paradoxically, little overlap in the references they cited. There continues to be no unifying force driving the psychology of musical cognition, development, or educational practice (Hargreaves, 1986). The authors of the aforementioned chapters were of one accord, however, in calling for more research and replication of research already in existence.

Justification for This Research

A great deal of progress has been made in understanding children's thought and development in the areas of reading, mathematics, and science, to name but a few (Bisanz & Bisanz, 1994; Siegler, 1986). In the public eye, however, most children continue to acquire these skills in accordance with their standardized progress through the public school system. Music, on the other hand, is probably the first domain that has dramatically challenged the public's understanding of children's potential. The introduction of early-childhood music programs around the world has changed society's expectations so much that what was once considered prodigious musical achievement is now considered average (Gardner, 1982; Hargreaves, 1986). Furthermore, we have evolved in North America from the inborn assumptions of Seashore (1919) to a point where it has become almost commonplace for children who are not considered prodigies to squeeze the practicing of difficult classical music repertoire between hockey practice and scouts! To borrow a term from the expert/novice literature, such a shift has provided us with an entirely new generation of musical 'experts' whose experience belies their age. Surely this is a fertile ground for research.

In their chapter Developmental Theories of Music Learning, Hargreaves and Zimmerman (1992) summarized trends in general cognitive theories of development. Of particular interest to the research reported here, they suggested a move away from universal developmental stages and toward domain specificity. I maintain that there is a wealth of knowledge about general cognitive development

that could be investigated within the musical domain. Before even entering into the debate about transferability or universality of cognitive structures and functions, one cannot escape the allure of this domain where our concept of the 'average' child has evolved so much within a few decades. The impact within the musical world is comparable to that of the unique and isolated pieces of research that have dramatically influenced the course of psychological thought, such as Piaget's detailed observations of his own children's development, Chi's (1978) introduction of the 10-year-old chess expert to the adult dominated expert/novice literature, or Miller's (1956) seminal report on the human memory's capacity to process "the magical number seven."

Aside from the inherent difficulties in researching complex musical performance in young children, this area has been neglected in favor of the Piagetian-influenced interest in musical development as it naturally unfolds (Bamberger, 1991; Campbell, 1991; Gardner, 1982; Hargreaves, 1986). Furthermore, there has been and continues to be widespread reticence about whether very young children should be exposed to intensive musical training (Hargreaves, 1986; Scott-Kassner, 1992). Hargreaves and Zimmerman (1992) suggested, however, that there is a trend "away from the view of development as unfolding, and toward one that pays much more specific attention to the active role of the instructor" (p.379). Interest is returning to the Vygotskian concept of the zone of proximal development (Hargreaves & Zimmerman, 1992; Vygotsky, 1986).

In the study reported here, I attempted to reconcile several of the problematic issues in the field of music psychology research. Contrary to the usual divisions in the field discussed earlier, the questions addressed were developmental and cognitive, and they certainly originated from, and aimed to inform early childhood education. This work examined the processes of young violinists who

were, by traditional definition, already very experienced in their field as they attempted to learn new music. This music contained short excerpts known to be familiar to the participants. By incorporating these familiar excerpts, I proposed to uncover potential cognitive relationships between what the child already knew and what processes that same child employed when presented with new material. Rather than theorizing about internal perceptual models of music, I aimed for ecological validity by incorporating descriptive and empirical data to analyze participants' musical behavior in one of the most ordinary (and yet unexplored) situations: the practice session. Listening can never be separated from musical thought, and listening to the new music was an integral part of this research design. The analysis, however, examined the processes that followed listening: the physical production of new repertoire and the practice strategies used to perfect that production.

CHAPTER 2

Review of Related Literature

There is no one body of literature that addresses the research reported here. As described in the introduction, this is because of the diverse research interests present in the field of music psychology. Furthermore, this study is in itself diverse. It asks questions that pertain to (a) inner cognitive processes as represented in musical performance -- more specifically, the relationship of old information to new; (b) development (e.g., Do the two age groups differ?); and (c) children's practice strategies. Lurking behind the questions is the omnipresent issue of how prior listening contributed to all of the questions. Following is an overview of the literature that inspired these questions.

Domain Specificity: Knowledge Base

Knowledge acquisition can be described as the accumulation and storage in memory of information about the world. The growth of this body of knowledge has become in itself one of the distinguishing features of cognitive development (Chi & Ceci, 1987). Stated simply, the more information that exists in a given domain, the easier it becomes to comprehend and organize new information. Many labels have been used to refer to this body of knowledge, such as knowledge base (Bjorklund, 1985, 1988; Bjorklund & Bernholtz, 1986; Chi, 1978,1981; Miller & Aloise, 1990; Pressley, Borkowski, & Schneider, 1987), prior or existing knowledge (Schmidt, DeVolder, DeGrave, Moust, & Patel, 1989; Siegler, 1986), and content knowledge (Chi, 1985; Chi & Ceci, 1987). Depending on the experimental paradigm being described, researchers have also referred to this phenomenon as domain-specific knowledge (Chiesi, Spilich, & Voss, 1979; McPherson & Thomas, 1989; Means & Voss, 1985); or, even more specifically, as conceptual knowledge (Bjorklund, 1985; Murphy & Wright, 1984). Researchers in the area of memory development

(which has played a leading role in the development of knowledge base theory), have identified prior knowledge as categorical knowledge (Rabinowitz, 1984) or as synonymous with semantic memory (Bjorklund, 1987).

The representation of knowledge in the knowledge base is generally depicted as a semantic network. The model most frequently referred to is that of a young dinosaur expert (Chi & Koeske, 1983). Chi and Koeske questioned the child about dinosaurs, and from his responses they created a network representation (consisting of nodes and links) of his knowledge. Well-known dinosaurs were more frequently linked and were more strongly associated than the less known dinosaurs. This finding has been extrapolated to many studies that test children's categorical knowledge (Bjorklund, 1985, 1987, 1988; Rabinowitz, 1984).

A connectionist (or neural network) model of musical processing has been developed by Fiske (1984, 1985, 1991, 1993, 1995/96) that supports these hypotheses on a theoretical level. His model suggests that incoming musical stimuli are subjected to a decision-making hierarchy that compares the new material to previously learned material in the memory. Semantic networks for general musical knowledge (not performance related) have also been suggested, but they offer little to our understanding of musical performance (Lindsey & Norman; as cited in Cutietta, 1985).

Hypothetically, in the field of music a knowledge base could be created by tapping into the well-known realm of folk songs for the participants in a given culture and comparing behavior in that domain with that of less familiar music. The use of familiar musical stimuli in Piagetian conservation-style tasks produced significantly better conservation-type responses than did unfamiliar stimuli (Hargreaves, Castell, & Crowther, 1986). This led the authors to conclude "that some other form of processing was operating in this case" (p. 98).

As early as 1976 researchers were examining differences on recall tasks across ages when the number of associations (in what was believed to be the participants' network pertaining to the stimuli) were held constant (Richman, Nida, & Pittman, 1976). The authors found that age differences in memory were eliminated when the stimuli to be recalled were salient (as operationalized by number of network associations) to the subjects. This led them to speculate that memory development depended on the acquisition of a rich network of information. Similarly, in 1980 Lindberg compared Grade 3 students with college students on free recall of lists of words that had been designed to be particularly meaningful to one age group or the other. Lindberg used references taken from popular children's cartoons (meaningful to the Grade 3 students) and from college-aimed cartoons (meaningful to the college students). He concluded that "the clustering data from Experiment 2 suggest that knowledge of the stimuli is a salient factor in grouping strategies in the free recall of words, and is not specific to the game of chess" (p. 408). Presumably, Lindberg's last comment was in reference to the expert/novice work being done at that time primarily in the domain of chess.

It was in the domain of chess that the standard view of children's memory limitations was challenged by Chi (1978). She demonstrated that the recall of 10-year-old chess experts for chess arrays was superior to that of adults who were chess novices, even though the adults outperformed the children on digit-span tasks. This experiment clearly showed that prior knowledge had a strong effect on memory that surpassed the assumed age limitations, but it did not necessarily indicate the exact nature of the knowledge base. The question still remained whether it was the familiarity and quantity of factual knowledge or increased strategic procedural knowledge that accounted for the adults' improved memory performance with numbers (a stimulus which should have been just as familiar to the 10-year-olds). Nonetheless, Chi's demonstration drew attention to the exciting fact that

prior knowledge could supersede what had been assumed to be age-determined limitations of memory. The growth of basic knowledge has since been acknowledged as an important variable, both in children's improved use of strategies and in their general memory development (Bisanz & LeFevre, 1990; Bjorklund, 1985, 1987, 1988; Bjorklund & Bernholtz, 1986; Bransford et al., 1990; Chi, 1978, 1981, 1985; Chi & Ceci, 1987; Chi, Feltovich, & Glaser, 1981; Chi & Koeske, 1983; Chiesi et al., 1979; Lindberg, 1980, 1989; McPherson & Thomas, 1989; Means & Voss, 1985; Ornstein & Naus, 1985; Rabinowitz, 1984, 1988).

Unfortunately, very little has been researched in the area of skills such as music that require a physical as well as a mental component. One exception was a study which examined 10- to 13-year-old tennis players (McPherson & Thomas, 1989). This study was significant because it compared not just the factual knowledge of expert and novice players, but also their decision making during actual performance. The findings provided some rare insights into the relationship between factual and procedural knowledge. McPherson and Thomas concluded that the two types of knowledge were developmentally related. As well, the correlation between content knowledge (i.e., factual and procedural) and game performance was high, with experts showing a higher in-game decision-making ability, which McPherson and Thomas attributed to a better conceptual structure of the game.

Knowledge-base research in music. Clarke (1988) described a similar schematic representation of a knowledge structure for a memorized musical performance. Using a hierarchical network that becomes increasingly narrow at the top, Clarke suggested that in a nonmemorized improvised performance or reading of a piece the links would be disjointed because the overall structure of the piece is being discovered as it is being played. In a memorized performance -- which he described as "the most pervasively generative representational structure" (p.10) --

he illustrated the links as being solid because the performer has a completed picture of what is to come. Clarke theorized that although the complete network exists prior to a memorized performance, however, it is only partially activated at any given point during that performance because of the attentional limitations of the performer.

Very few pieces of research have explicitly connected music learning and knowledge base. Two exceptions are the work of Gruson (1988) -- which will be discussed presently -- and that of Oura and Hatano (1988). In tests of college and Grade 4 piano students and musically inexperienced participants they found that the younger, experienced students outperformed the older, inexperienced group in accurate recall of a tonal (western) melody. Inexperienced college students outperformed the younger students, however, in the memorization of a poem, which confirmed the expected general cognitive differences because of age. All participants performed less well when an atonal (Japanese) melody was used for the memorization task. From this, the researchers concluded that style specific knowledge was the most critical element in the memorization of new melodies.

It is my belief that a semantic model of the knowledge base provides a possible explanation for the building of musical skill. A distinguishing feature between expert and novice musicians has obviously been the amount of repertoire that has been studied. An important distinction, however, becomes obvious to the instrumental teacher even between students whose musical experience is quantitatively similar. It is not simply how much music has been played, but also what can be comfortably performed at a given point in time. We need only to look at the performance schedules of the greatest performing artists to realize that not only do these individuals play well, but they also play a great deal of music well. Compare this to the well-known image of the music student who memorizes one piece for the spring recital each year, and the qualitative and quantitative differences

become clear. This is an expert/novice paradigm that has relatively simple instructional implications: Review and frequent performance of previously learned material could assist the music student in being more 'expert-like.' Davidson and Scripp (1992) came to the conclusion that "it is necessary to continually revisit what was learned in the past in order to maintain contact with what we know today" (p. 397).

Instructional research has focussed on the teaching of strategies (Siegler, 1986). Although increased strategy use is certainly a major explanation of developmental changes in cognition, it seems (especially in the light of Bjorklund's [1985] theory of automatic activation of associations from a strong network) that the concentration on strategy acquisition may not be the only way to help children learn more efficiently. Knowledge-base researchers have consistently come to the conclusion that strategy instruction is most useful in the context of a strong knowledge base (Bjorklund, 1985, 1987; Chi, 1985, 1987; Ornstein & Naus, 1985; Rabinowitz, 1988). Rabinowitz, when discussing the importance of accessibility of knowledge for strategy use, stated explicitly that strategies must be taught using easily accessible knowledge if they are to be used consistently. The implication is still that knowledge precedes strategy use. In musical terms, repertoire already studied could be considered this knowledge and thus the knowledge-base literature informs the questions asked in this study about the practice process and strategy use.

Acquisition of New Material: Practicing

"People get better on task with practice" (Neves & Anderson, 1980, p. 57). Considering what a fundamental role practice plays in the lives of musicians and music students everywhere (Sloboda, 1985), it is surprising how little research actually aims to examine the practice process. One is hard pressed to find the concept given more than a glance in a majority of music psychology texts (Colwell,

1992; Davies, 1978; Mursell, 1971; Radocy & Boyle, 1988, Shuter-Dyson & Gabriel, 1981; Sloboda, 1988). If one heeds the call for a marriage between psychological research and education (Davidson & Scripp, 1992; Scott-Kassner, 1992; Weerts, 1992), then certainly practice must become a central focus for researchers and educators (McPherson, 1995).

Current research about music practicing has been diverse. Barry (1992) found with brass and woodwind students between Grades 7 and 12 that, predictably, supervised practice was more effective than unsupervised practice. One examination of biographical precursors of musical excellence revealed that the higher ability children actually practiced less than their less skilled colleagues (Sloboda & Howe, 1991). A very different sort of study measured vocal accuracy in 7- to 8-year-old children and concluded that out-of-tune singing could be remedied with practice if visual information about the errors made was provided (Welch, 1985).

The field of music can also be informed by research on practice in other areas such as flight training, swimming, and dart throwing (Rideout, 1992). Rideout stated: "A host of research studies in physiology, psychology, and physical education indicate significant improvement can occur in the development of skills through mental practice, the act of mentally rehearsing or practicing model behaviors without accompanying physical movement" (p.474). University-aged trombone students confirmed the advantages of combining mental and physical practice in the acquisition of an etude (Ross; as cited in Rideout, 1992).

An often cited study of musical practicing is that of Gruson (1988), who prefaced her report with comments about the chunking of information characteristic of increasing skill in many areas. She noted that this chunking has also been observed in music sight reading studies. In Gruson's (1988) study 43 pianists of varying age and level were asked to practice three pieces of music. Their practice

sessions were recorded on audio tape and then analyzed using an Observational Scale for Piano Practising. This scale included many identified behaviors in categories such as repetition, tempo changes, and verbalizations. Some of the pianists (representing novice to professional) were also recorded for nine further practice sessions. These students were also interviewed, and their responses were categorized into practice strategies. Gruson admitted to several weaknesses in the study; in particular, the small sample size at each musical level. One conclusion of interest to a knowledge-base model of music acquisition, however, was that it was "many hours of practising a wide variety of music pieces that influences practising behaviours" (Gruson, 1988, p. 104). Gruson also concluded that significant changes occur in practicing as a result of increased competence on the instrument. Higher music level corresponded with more repetition of sections but less repetition of notes, more verbalizing, longer practices with fewer pauses, and more hands-separately practice. Her most significant finding, however, was that when more skilled players made an error, they tended to repeat larger units of the piece when correcting the error. She attributed this to the more competent performers' ability to 'chunk' more material meaningfully.

Barrett (1993) conducted a very different acquisition study of musically inexperienced Grade 4 students who were asked to figure out familiar melodies on resonator bells. She established the presence of three types of strategies utilized by the students: (a) temporal ordering strategies, (b) comparison strategies, and (c) inferring strategies. The children fell into three groups: (a) aural solvers, (b) nonsolvers, and (c) visual solvers. All participants but one were able to reproduce at least part of the target melodies.

Of particular interest in this study was the fact that participants were working 'by ear' rather than from printed music. Because all of the children were chosen for their lack of musical background, however, this study aligns itself with

the developmental literature with its emphasis on discovering children's natural responses to musical stimuli. As such, it does not inform the teacher of strategies likely to be used by the more proficient music student.

Practice strategies. Barry and McArthur (1994) who asked 94 music teachers about how they teach practicing in their studios, also identified eight strategies that the literature revealed as conducive to improved performance:

1. Structured and sequential practice promotes skill acquisition.
2. Mental practice along with physical practice yields the best results.
3. Shorter practice sessions are more effective than longer sessions.
4. Practice that is evenly distributed over time is better than a great deal of practicing at one time.
5. Goals must be established for effective practice.
6. Supervision increases practice effectiveness.
7. A written record of practice time does not necessarily improve practicing.
8. Aural models promote improvement.

Teachers who responded to the survey indicated that they always or almost always emphasized practicing in their studios. Their responses to which specific types of practice strategies they emphasized did not always correspond with the research literature. Barry and McArthur concluded that teachers, although obviously interested in helping their students to improve practicing, did not always have a systematic way to verbalize the necessary information to students.

Suzuki Method Background

As a Suzuki educator I have a particular interest in this method and it was certainly not by accident that the participants in this study were all Suzuki students. It should be noted, however, that this project does not set out to 'prove' the value of the Suzuki method. The effort, instead, is to discover potential cognitive underpinnings in instrumental music acquisition that might inform all educators,

both musical and otherwise. A relatively extensive body of research examining children's vocal, rhythmic, and aural development already exists (Scott-Kassner, 1992); and this research has nourished the classroom, vocal, Kodaly, or Orff teacher. A comparable source for the private instrumental teacher who must deal with all of the general musical issues as well as the uncharted territory of motor development and skill is nonexistent (Geringer & Madsen, 1987; Gilbert, 1981; Hedden, 1987).

Upon returning to Japan in 1928 after an eight-year period of musical and cultural study in Germany, Suzuki (1983) was struck with the fact that, in contrast to his struggles with the German language, "all Japanese children speak Japanese!"(p. 1). He began to develop a philosophy of how children learn based on his observations of young children. Because of his passion for the violin, music education became his medium. His philosophy was, it appears, intuitively generated from his unique perspective of both Eastern and Western thought.

In contrast to Seashore (1919), Suzuki (1983) denied that musical talent was an inborn trait. He claimed instead that every child had unlimited potential in any domain given the correct environment. Citing every child's amazing ability to learn a "mother tongue," Suzuki sought to simulate what he called the natural learning environment of the child. He proclaimed the following belief system as the basis for his pedagogy:

- People are the children of their environment.
- Every child has unlimited potential.
- Ability is developed at an early age.
- Parents are the child's first and most important teachers.
- Children learn from one another.
- Success breeds success.

From these beliefs he established an extensive music methodology that included the following key factors:

- emphasis on starting lessons in the preschool years with active and prolonged involvement of one or both parents
- extensive listening to the repertoire being studied
- step-by-step acquisition of skill with thorough mastery of each step
- use of repertoire to establish technique (replacing many scales and etudes)
- one-point lessons
- overlapped private lessons where parents and children observe others
- extensive review of previously learned repertoire
- group lessons and concerts for motivation
- postponement of note reading until instrumental technique is established and the child is learning to read language.

Despite his emphasis on musical excellence, Suzuki's (1981) main educational goal was never to produce professional musicians:

> It is necessary to be concerned about the importance of educating a really beautiful human spirit. Teaching intonation, and teaching technique will never be more than a method. We are burning with a deeper mission that we must do something for the future. Music exists for the purpose of growing an admirable heart (pp. 61-62).

The Suzuki method has become recognized for its success with young instrumentalists (Gardner, 1982; Kendall, 1966/78; Landers, 1980). Nelson (1983) wrote: "Music education has developed many unique and sophisticated approaches to instruction that reflect this principle. The Suzuki 'mother tongue' approach couples an innate aural skill of children with the physical manipulation of instrumental performance" (p. 70).

Over the years, traditional teaching has incorporated many features that were once exclusive to Suzuki's pedagogy; for example, listening to recordings of music

being studied (Barry & McArthur, 1994). The Toronto-based Royal Conservatory of Music now provides recordings of the repertoire required for annual examinations. Review of previously learned repertoire has remained one of the distinguishing pedagogical features of Suzuki teaching. I have chosen to examine the psychological implications of this particular aspect of Suzuki pedagogy in an effort to pinpoint key factors that could assist children and their parents in the difficult and complicated task of building musical skill.

Review of Previously Learned Repertoire: Background

Suzuki students are asked to continue playing ("reviewing") all of the repertoire they learn even as they progress to higher volumes of literature. In addition to the pedagogical goal of maintaining these pieces for use in group lessons and concerts, the belief is that this repetition or review of previously learned repertoire equips or assists the child in acquiring new repertoire. What is unclear is how this review material may impact the child's learning process. There are several possibilities:

1. The child who plays all pieces regularly is simply practicing more than the child who concentrates only on new material and, consequently, progresses more quickly and easily through the repertoire.
2. The child who reviews regularly also tends to follow the teacher's other instructions more carefully and, consequently, progresses more quickly and easily through the repertoire.
3. The child who reviews regularly experiences satisfaction from playing pieces easily and accurately and is, consequently, motivated to participate and practice more.

As plausible as these arguments are, however, these three factors (extended practicing, following instructions, and motivation from successful performance) can be present in the absence of review. Many teachers (Suzuki and traditional)

have had students who have achieved a reasonable degree of success without reviewing previous material to the degree suggested in Suzuki's method. Whatever their motivation may be, these students follow the teacher's instructions, practice carefully for long periods of time, and they progress accordingly. Perhaps such students have maintained our belief that some people are musically gifted and others are not. Suzuki (1983), however, argues that all children can experience a high degree of success on a musical instrument even without an "inborn" predisposition to play. He has confirmed this hypothesis in the eyes of the world for the past 50 years as hundreds of thousands of children using his method achieve a level of musical success previously considered to be the domain of a talented few (Gardner, 1982; Kendall, 1966/78; Landers, 1980; Suzuki Information Kit, 1996; Zdzinski, 1996).

The psychological importance of this has been the fact that embedded in his method is a formula for musical success that can reach children from diverse backgrounds, with nonmusical parents, whether or not they begin with an inner motivation to practice for long periods of time. Many of the motivational aspects of his method are also present in good traditional teaching (Starr, 1976; Wickes, 1982). Historically, however, there has been a stronger polarity in music education between children who are very successful and those who struggle without achieving great success before dropping out (Gardner, 1982; Sloboda & Howe, 1991; Weerts, 1992).

Psychological implications of review. The following are some of the potential psychological implications of review:

1. The child who reviews regularly may be able to utilize familiar pieces to study new techniques (a teaching technique commonly used to varying degrees by Suzuki teachers) without being hindered by the attentional demands of reading or remembering note patterns.

2. The child who reviews regularly may build automaticity in the actual motor skills used to play, thus freeing the child to attend to the cognitive demands of new repertoire more easily.

3. Reviewing regularly means that the child is actually hearing the pieces more often; and, consequently, it may be the increase in listening to the music that is impacting the progress. (There are several hypotheses about the effects of listening on musical learning [Keele; as cited in Wickes, 1982]. Campbell [1991] described Gibson's [1969] suggestion that musical features such as melody and rhythm are increasingly extracted over repeated hearings, resulting in better organization or understanding of the music. Although the effect of listening on music learning could constitute an entirely different thesis, it must be noted here because it is also a crucial assumption in Suzuki pedagogy and as such was included in the design of this study.)

4. Different approaches to review (i.e., playing through with the tape versus "playing around" with old repertoire versus regular performance) may impact differently on the acquisition of new material.

5. The child who reviews regularly may actually recognize (at a cognitive level) when familiar passages, notes, or bowing patterns are present in new material and, consequently, may be able to allocate time to less familiar passages.

6.The child who reviews regularly may actually experience interference when passages that are automatic are encountered in a slightly altered form in new repertoire.

Hypotheses

Keeping in mind the semantic model of previously learned material, these last two possibilities invited further examination. It was therefore hypothesized that when asked to memorize a musical selection (test piece) that was composed primarily of new musical material but which contained a musical component (C)

lifted directly from literature known to be in the child's repertoire (previously learned piece):

1) the child's performance of the component (C) in the previously learned piece would correlate positively with the performance of the same component within the context of the test piece,

2) the child would make fewer errors in the familiar component (C) than in an unfamiliar component (D) that was equal in length and difficulty to the familiar component,

3) the child's success in performing the previously learned piece during the test session would be negatively correlated with the number of errors in the component C in a memorized final performance of the test piece, and

4) the child would allocate less practice time to the familiar component (C) than to the new material.

Furthermore, it was hypothesized that the children with higher success in the previously learned piece would have higher overall success in memorizing the test piece while children with lower success in the previously learned piece would have less overall success with the test piece in general. These hypotheses were operationally defined in the following terms:

5) the child's success in performing the previously learned piece would be positively correlated with the overall musical rating of the final performance of the test piece, and

6) the child's success in performing the previously learned piece would be negatively correlated with the number of errors in the final performance of the test piece.

It was also expected that background information about the students such as the usual amount of review, the amount of listening to music to be studied, participation in concerts and group lessons, and practice habits would relate to their

performances of the test pieces as well as their ability to perform the previously learned pieces at the test session.

Built into these hypotheses were several features borrowed from musical perception paradigms that in turn were borrowed from the area of memory research (Sloboda & Parker, 1985). The use of recall tasks versus recognition tasks was discussed by Sloboda and Parker. They noted the disadvantages of both type of tasks; namely, the artificial nature of recognizing fragmented sections of music and the messiness of recall data, which allow for much more unaccountable behavior. I believe that this study has dealt with both of these concerns. The recognition part of the task (familiar component C) was implied. Furthermore, the participants were asked to play the passage rather than simply identify it in a listening test. The main concern with recall data was the participants' inability to reproduce a musical passage. Because this study used musically experienced participants, this was not an issue.

CHAPTER 3

Method

Participants

Two groups of Suzuki violin students were identified as participants for this study. The book 2 group consisted of 12 children (7 girls, 5 boys) between the ages of 6 and 8 years (M = 7.9 yrs) who were studying in volume 2 of the Suzuki violin repertoire. They had been studying the violin for an average of 3.3 years. The book 4 group consisted of 9 students (5 girls, 4 boys) ranging from 10 to 12 years old (M = 11.6 yrs) and studying in volume 4 of the Suzuki violin repertoire. This group averaged 6.25 years of violin instruction. All of the students were residing in Edmonton, AB, or the surrounding area; and all studied with Suzuki violin teachers in Edmonton. Students were chosen for participation according to their age and current playing level from class lists of Suzuki violin teachers in Edmonton.

Stimuli

Two 16-measure violin pieces were written for this study. Test piece 1 (TP1) was identified to the children as The Maple Tree and test piece 2 (TP2) was identified as The Birch Tree. The Maple Tree was 24 seconds long when played at a tempo of 1/4 note = 80. It contained component one (C1), which consisted of measures 3 and 4 from the piece Song of the Wind (the third piece in Suzuki Violin School: Volume 1). It also contained an unfamiliar component (D1), which was based on C1 (see Figures 1 and 2).

The Birch Tree was 25 seconds long when played at a tempo of 1/4 note = 112. It contained component 2 (C2), which consisted of measures 15 and 16 from Minuet #2 (the 14th piece in Suzuki Violin School: Volume 1). This piece also contained an unfamiliar component (D2) derived from C2 (see Figures 3 and 4).

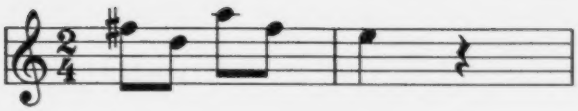

Figure 1. Familiar component C1 (The Maple Tree)

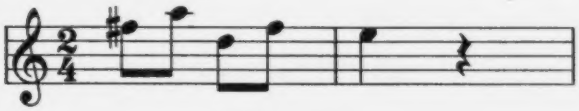

Figure 2. Unfamiliar component D1 (The Maple Tree)

Figure 3. Familiar component C2 (The Birch Tree)

Figure 4. Unfamiliar component D2 (The Birch Tree)

The placement of the components C1, C2, D1, and D2 was reversed within TP1 and TP2 so that half the subjects in each age group encountered C before D and vice versa. The former order (C before D) was referred to as TP1a or TP2a. The latter (D before C) was referred to as TP1b or TP2b. The surrounding material remained the same in all conditions (see Figures 5, 6, 7, and 8).

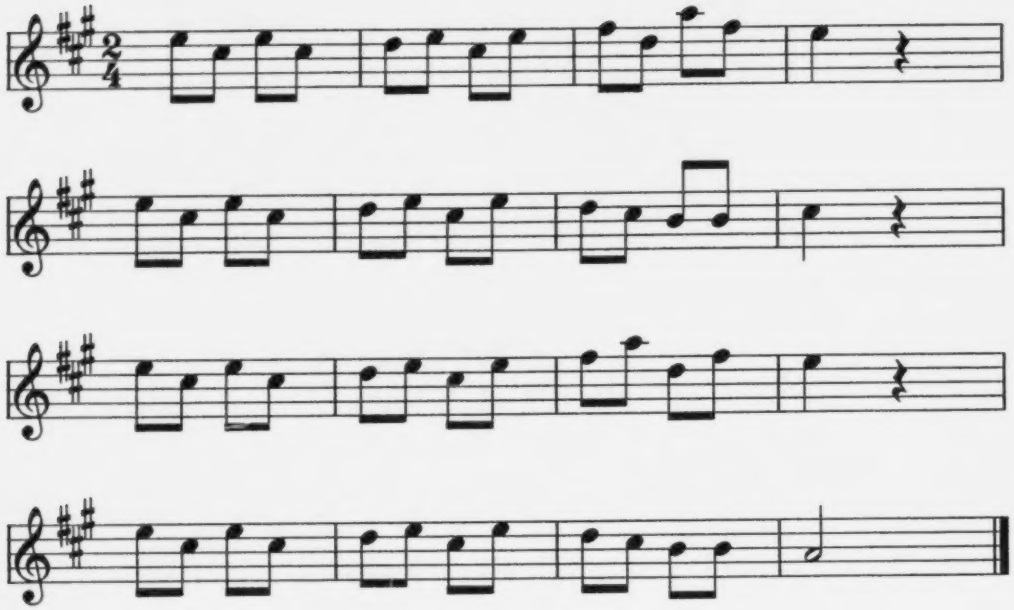

Figure 5. TP1a : The Maple Tree (C1 precedes D1).

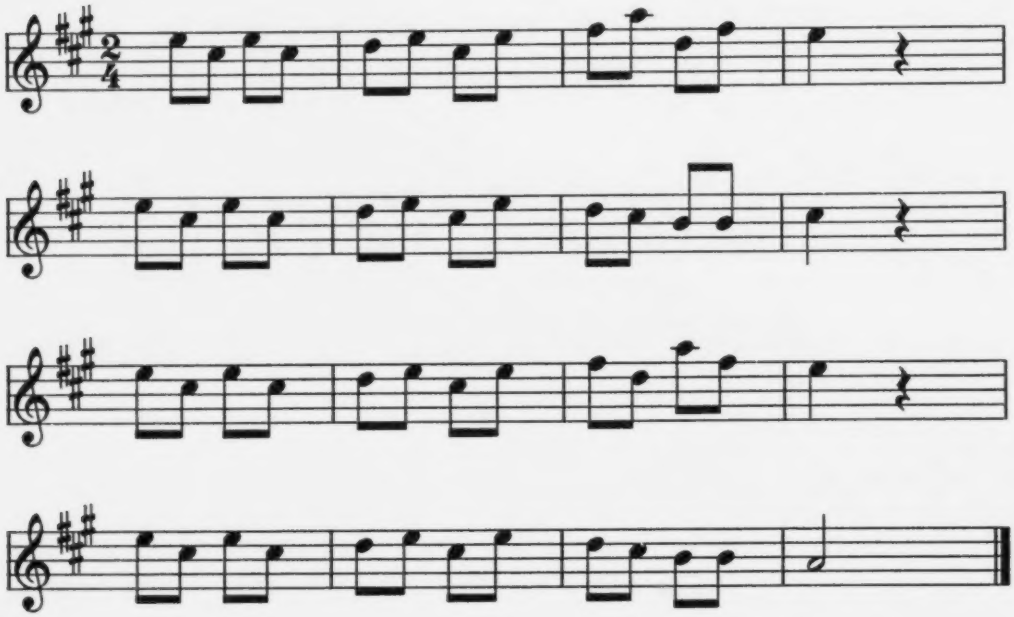

Figure 6. TP1b: The Maple Tree (D1 precedes C1).

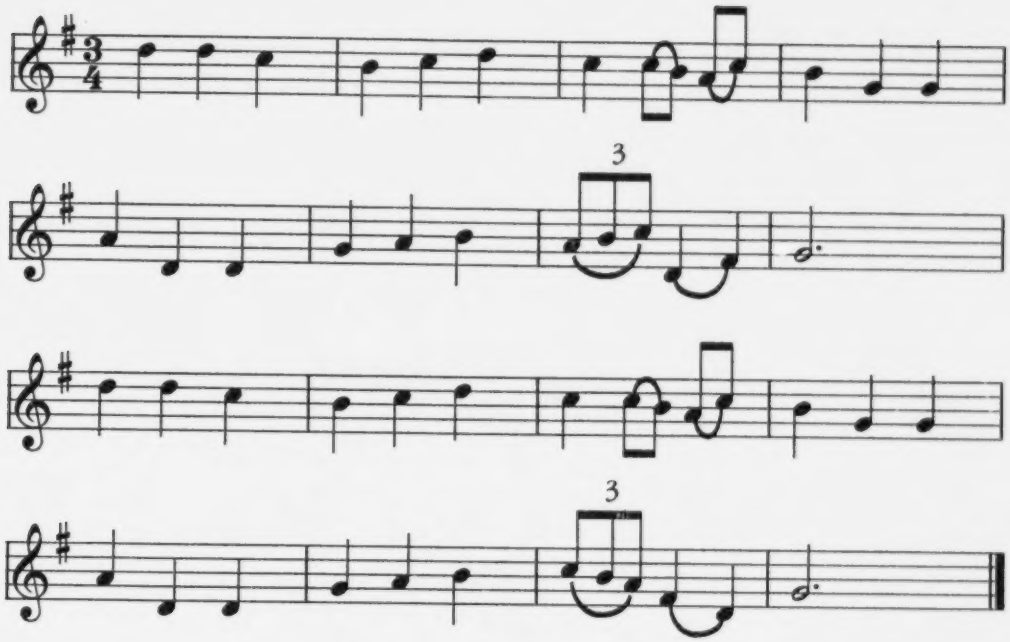

Figure 7. TP2a: The Birch Tree (C2 precedes D2).

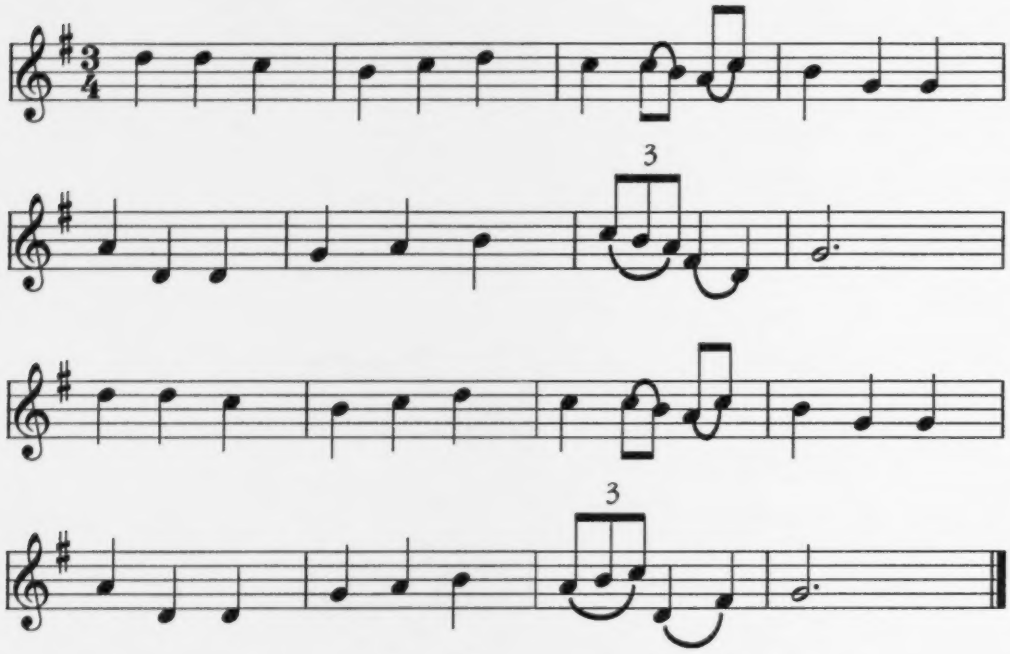

Figure 8. TP2b: The Birch Tree (D2 precedes C2).

To avoid any order effects, the order in which TP1 and TP2 were listened to and subsequently introduced during the test sessions was also reversed so that

Condition 1 =	TP1a	TP2b
Condition 2 =	TP1b	TP2a
Condition 3 =	TP2a	TP1b
Condition 4 =	TP2b	TP1a

The conditions were assigned equally to both genders as well as the two age groups.

Procedure

Upon receipt of parental consent forms (see Appendix A), participating students were issued a questionnaire (see Appendix B), a listening chart with stickers (see Appendix C), and a cassette recording (FUJI DR60, Type 1 [Normal])

of a solo violinist playing one of the four conditions. On the first playing, the pieces were prefaced with their title to facilitate references to the pieces during the test session. The two pieces were then dubbed on each cassette for a total time of 10 minutes to avoid the parent or child having to rewind the tape repeatedly. This process was intended to simulate the normal learning environment of the Suzuki student, which includes repeated listening in advance to repertoire that will be studied. In order to ensure that listening in advance of the test session occurred, the child was provided with the listening chart and stickers to fill in each day for two weeks. As well, the parent and child were told that bringing the completed chart to the test session would ensure that the child received a reward. Parents were not rewarded for returning the questionnaire, but if they did not have it completed by the test session date, they were asked to complete one before leaving the test session.

The test sessions were held in an Elementary Department music classroom (Rm. 471, Education South) at the University of Alberta on three different days (Wednesday, June 19; Saturday, June 22; and Sunday, June 23, 1996). In addition to the usual furnishings (piano and plastic moveable bleachers), the room contained a music stand with the music for the test pieces on it, several chairs, a cassette tape recorder, and a Sony video camera (CCD-TR700) on a tripod.

The children were scheduled 45 minutes apart. Upon arrival, the children and their parents were welcomed by the researcher and a male University of Alberta student who was introduced as the assistant. After collecting the questionnaire and listening chart and tuning the violin for the child, the researcher and the parent left the child with the assistant in the testing room, and the camera was started. Only the youngest child needed the parent to return to the room, and this was only to fix a technical difficulty with the instrument's shoulder rest.

Depending on which condition cassette the child was listening to, the assistant asked the child if she or he remembered The Maple Tree (or The Birch Tree) from the home recording. The cassette recording of the piece was then played once to ensure that the child knew which piece was being requested. The assistant instructed the child to try to learn the piece:

> "Now I'd like you to pretend that your teacher surprised you and told you you have to play this piece by memory tomorrow at a concert! Try to learn it so that it sounds like the tape you've been listening to without any mistakes. The music is on the stand if you want to use it, or you can just figure it out by ear. Do you have any questions?"

If the child was unable to start, the assistant indicated the starting note (by string name and finger number). If the child was still unclear, the recording was played again.

The assistant began timing the child as soon as the child began to practice and operated the camera during this time. At the 6-minute mark (6 min) the assistant asked the child: "How is it going so far? Could you play for me what you've been practicing?" The music was turned over on the stand, and this performance was considered the 6-minute final performance (fpTP1-6 or fpTP2-6). The child was then asked to continue practicing until he or she refused to continue or until the 12-minute mark (12 min). At this point the assistant asked for a final memorized performance of the test piece (fpTP1-12 or fpTP2-12).

The justification for memorized final performances stemmed from the conviction that the true test of western classical music performance lies in the memorized performance (Sloboda; as cited in McPherson, 1995/96; Zielinska & Miklaszewski, 1992). Furthermore, the interest in examining children with extensive musical experience was based on the possible connections in memory that inevitably impact musical processing and subsequent learning (Clarke, 1988; Cutietta, 1991).

The child was given a 2-minute break to sit down and retune the instrument if necessary while the assistant changed the music on the stand for the subsequent test piece. Exactly the same procedure was followed with the remaining test piece. Upon completion of the second test piece, the assistant praised the child and then asked for a mini concert of the two previously learned pieces (in the order corresponding to each child's condition). Every child was familiar with the review pieces requested, although several of them needed the two-measure tape recording played to remind them of how the pieces started. The child was asked: "When did you last play this piece?" and the parent was asked the same question outside by the researcher.

Upon completion of the test session, the child was praised; and both the child and parent were thanked for their participation. The child was invited to choose a reward, which included a McDonald's gift certificate and a chocolate bar.

Dependent Measures

Objective error counts (OECs). The first dependent measure was the number of errors in the TP and PLP performances. Errors were operationally defined as notes that were of incorrect pitch. This measure was intended to be as objective a description as possible of the child's accuracy in the performances. The stringency of counting exactly what was played as opposed to what was intended was justified because of my interest in the automaticity of the components and previously learned pieces. After considering several systems of error evaluation (Oura & Hatano, 1988; Salzberg & Wang, 1989; Sloboda & Parker, 1985; Zielinska & Miklaszewski, 1992) the following system was devised.

It became apparent, with only two notable exceptions (which will be discussed in Chapter 4), that the only rhythmic errors made by the children were inevitably linked to problems in locating the correct pitches. Consequently, error counts were simplified to include only false starts and incorrect notes. A point was

awarded for each note that was incorrect, and when a student repeated a phrase or section of a piece to correct something, one point was added for each false start or unnecessary repeat, but errors in the passage were counted only on the first playing. Error counting was resumed when the child reached the point at which she or he had stopped to go back in the music. Minor intonation problems and incorrect bowings were disregarded in the counting of errors but were considered in the overall musical ratings, which are discussed later. If entire sections of a piece were missed by the student, the sum of notes missed was added to the error score to reflect the student's inability to perform the piece accurately. Repeats are called for in both Song of the Wind and Minuet #2, but because several children neglected to play these repeats all scoring was based on the first playing of each section only.

Error scores were calculated for each of the contained components and final performances of both test pieces at the 6- and 12-minute marks. In addition, errors were counted in the performances of the previously learned pieces, with special attention to whether any of the errors occurred during the exact two-measure passage that corresponded with the test piece components (C1 and C2). There were 16 error counts in total for each participant.

Overall musical ratings (OMRs). In contrast to error counts a more global musical evaluation allows for the subtle differences among performers to emerge. It was assumed for this study that if a piece was thoroughly mastered, the overall general impression would improve, and therefore an overall musical rating scale was developed. The very nature of an overall musical rating evaded a perfectly objective measurement tool, however, because the musical judge traditionally has taken many subjective aspects of the playing into consideration before arriving at a single mark or rating (Wing, 1968). Musical interpretation of the music being performed, tone production, stage presence and the technical approach to the instrument are just a few of the factors included in standard evaluation of musical

performance. Furthermore, western musical performance has been measured by its ability to stir the emotions of the listener (Grout, 1980; Machlis, 1977). As discussed in Persson & Robson (1995): "From the musician's point of view science and the musical endeavor are often regarded as incompatible opposites"(p.42). The difficulty in resolving these opposing positions of artistic musical evaluation and scientific rigor coupled with the tendency in music psychology to concentrate on musical aptitude or perception has unfortunately left us with little in the way of standardized instrumental performance tests. In the absence of such a tool for evaluating the instrumental performance in this setting, I felt that the guidelines put forward by the Canada-wide conservatory examination systems could provide me with a model for evaluation that reflected the opinion of music educators in this country. This intuition was supported by the work of McPherson (1995/96) who used the Australian examination system as the basis for his ratings of musical performance.

Using the somewhat vague suggestions for adjudication in the Western Board of Music Examiner's Manual, the Royal Conservatory of Music's Examiner Guidelines for Assessment of Piano Examinations and the Consensus of Examiners' Proposed Guidelines for Assessment of Woodwind, Brass & Percussion Examinations a list of guidelines was compiled for evaluating student performances. (A printed set of guidelines for RCM string examiners was not available.) The most important distinction between this new list and that of the examiner's manuals was the presence of the definition of each skill at every level. In the manuals many skills that were mentioned -- for instance at the lowest level -- were defined only by their absence at the highest level. From the lists I was able to identify 13 categories that needed to be considered in the overall musical evaluation of any one performance. Each category was then subdivided into four levels of accomplishment. In some cases these levels were simply ratings of poor, mediocre,

good, and excellent; whereas others were very specific guidelines such as "always uses suggested bowings" and "10 or more departures from suggested bowings" (see Appendix D).

The overall musical ratings of each child's performance were given by two 'expert' raters. Rater 1 was a female violinist who teaches string instruments with the Edmonton Public School system. Rater 2 was a male member of the Edmonton Symphony Orchestra and a private violin teacher.

Each rater viewed clips of each child playing the two test pieces at the 6- and 12-minute marks, as well as each child's performance of the previously learned pieces, so that there were six overall musical ratings per child. The raters viewed the tapes independently of each other but on the same television (RCA 20", model F20637ET) and VCR (RCA model VR621HF). Both raters required two sessions lasting about three hours each to view all of the participants. The videotapes were dubbed so that the children appeared in a different order for each rater.

The experts were instructed to place a check mark on the rating form (see Appendix D) at the appropriate level in each category for each performance. Numerical scores were assigned to the levels (with the lowest level being 1 and the highest level being 4), such that the maximum overall musical rating for a performance was 52 points. The interrater reliability on each of the six performances was strong (see Table 1). Once this reliability had been ascertained, the scores given by the raters were collapsed (means were calculated) so that there was one overall musical rating per child of each performance.

Table 1

Interrater Reliability for Overall Musical Ratings

Piece	Pearson correlation		
Maple Tree (6 min.)	.8175	($p < .0001$)	$N = 20$
Maple Tree (12 min.)	.8873	($p < .0001$)	$N = 19$
Birch Tree (6 min.)	.8709	($p < .0001$)	$N = 20$
Birch Tree (12 min.)	.8668	($p < .0001$)	$N = 19$
Song of the Wind	.7199	($p < .0001$)	$N = 20$
Minuet #2	.8332	($p < .0001$)	$N = 20$

Actual practice time (APT). Although each child was encouraged to practice for 6 minutes before the 6-minute performance of the test piece and then 6 more minutes before the 12-minute final performance, many of the children, because of fatigue or the variability of personal criteria for performance readiness, did not use all of the allotted time. This problem was anticipated, but for ethical reasons the children could not be forced to practice longer than they chose. Consequently, a measure (in seconds) of the actual practice time (APT) in each segment of the test session was recorded, as well as the total practice time for each test piece.

CHAPTER 4

Results and Discussion

Because of the confusion created by the numerous variables, the results and discussion of the results have been combined. Whenever performance measures were needed in analysis, at least eight different measures were used: the error counts in The Maple Tree at the 6- and 12-minute mark, the overall musical ratings for the two performances of the same piece, the error counts in The Birch Tree at 6 min and 12 min and the overall musical ratings of the same in both performances.

One child in the book 2 group was dropped from the study following her test session because she was unable to attain an adequate performance of either test piece. The few notes that she learned were accomplished only with constant input from the assistant that far exceeded the level of assistance provided for the other participants. Two other students did not play the second performance of a test piece. In one case, the assistant forgot to instruct the child to begin the second practice session of The Maple Tree. In the other, the child became upset and gave up learning The Birch Tree.

Means and standard deviations for the most important variables are in Tables 2, 3, and 4. They have been calculated both for the entire group and also after dividing by group level.

Table 2

Mean Performance Scores (All Participants)

Piece	Mean	Std. dev.	N
		Error counts	
Song of the Wind	2.3	2.4	20.0
Minuet #2	17.3	28.0	20.0
Maple Tree (6 min.)	5.1	6.3	20.0
Maple Tree (12 min.)	3.1	3.6	19.0
Birch Tree (6 min.)	10.8	15.0	20.0
Birch Tree (12 min.)	8.5	12.3	20.0
		Overall musical ratings (out of possible 52 points)	
Song of the Wind	39.9	5.3	20.0
Minuet #2	33.9	6.9	20.0
Maple Tree (6 min.)	38.3	6.9	20.0
Maple Tree (12 min.)	39.9	5.1	19.0
Birch Tree (6 min.)	36.3	8.5	20.0
Birch Tree (12 min.)	38.5	7.3	19.0

Table 3

Mean Performance Scores by Group

Piece	Group 2 Mean	Group 2 S.D.	Group 2 N	Group 4 Mean	Group 4 S.D.	Group 4 N
			Error counts			
Song of the Wind	2.2	2.1	11.0	2.3	2.8	9.0
Minuet #2	8.9	14.2	11.0	27.6	37.4	9.0
Maple Tree (6 min.)	6.3	7.6	11.0	3.6	4.2	9.0
Maple Tree (12 min.)	4.6	4.4	10.0	1.4	1.3	9.0
Birch Tree (6 min.)	11.8	15.3	11.0	9.6	15.4	9.0
Birch Tree (12 min.)	13.2	14.9	11.0	2.7	2.7	9.0
			Overall musical ratings (out of possible 52 points)			
Song of the Wind	38.9	6.4	11.0	41.3	3.3	9.0
Minuet #2	36.6	6.8	11.0	30.7	5.9	9.0
Maple Tree (6 min.)	37.8	6.3	11.0	38.9	8.1	9.0
Maple Tree (12 min.)	38.5	5.9	10.0	41.6	3.6	9.0
Birch Tree (6 min.)	35.2	8.3	11.0	37.5	8.9	9.0
Birch Tree (12 min.)	35.8	7.8	10.0	41.6	5.4	9.0

Table 4

Actual Practice Time by Group

Practice Period & Piece	Group 2 Mean (sec.)	Group 2 S.D.	Group 2 N	Group 4 Mean (sec.)	Group 4 S.D.	Group 4 N
Prior to first performance of Maple Tree	251	90	11	270	136	9
Before final performance of Maple Tree	149	89	10	227	142	9
Total practice (Maple Tree)	406	163	10	497	269	9
Prior to first performance of Birch Tree	290	73	11	314	70	9
Before final performance of Birch Tree	146	113	11	255	139	9
Total practice (Birch Tree)	436	159	11	562	218	9

Correlational Analysis

Pearson product moment correlations were calculated using all of the dependent variables (16 error counts, six overall musical ratings and six measures of actual practice time), and 47 independent variables as identified in the questionnaire. Several composite variables were also created, such as 'listening levels', which subdivided the total listening time into three categories: low (0-149 min.), medium (150-299 min.), and high (300-449 min.). The program used to calculate the correlations (SPSS) made the necessary adjustments in calculations for categorical and continuous data. Because of the exploratory nature of this study most analyses were conducted after the initial examination of the correlations.

Hypothesized Relationships

Previously learned piece: test piece. The hypothesized relationships between the previously learned pieces (Song of the Wind and Minuet #2) and the test pieces (The Maple Tree and The Birch Tree) were supported insofar as the overall musical ratings (OMR) of the previously learned pieces (PLPs) were correlated with both the error counts and overall musical ratings in the test pieces with the exception of the 12-minute performance of The Birch Tree (see Table 5). The number of errors in the previously learned pieces, however, did not correlate with either the errors or the overall musical ratings of performance on the corresponding test pieces.

Table 5

Correlations Between Previously Learned Piece Scores and Test Piece Scores

	Overall musical rating of Song of the Wind		
Overall musical rating Maple Tree (6)	.5923	p = .006	N = 20
Overall musical rating Maple Tree (12)	.7156	p = .001	N = 19
Errors - Maple Tree (6)	-.5494	p = .012	N = 20
Errors - Maple Tree (12)	-.7223	p = .000	N = 19
	Overall musical rating of Minuet #2		
Overall musical rating Birch Tree (6)	.6999	p = .001	N = 20
Errors - Birch Tree (6)	-.4955	p = .026	N = 20

Although many of the hypothesized relations existed between the previously learned pieces and the test pieces, it must be noted that many correlations also existed between performance variables not related according to the original hypotheses. There were also many correlations that, although statistically significant, held no psychological meaning. Examination of the many coefficients was complicated by the very small sample size ($N = 20$), and the findings should be interpreted with caution.

One conclusion to be drawn from the high number of significant correlations between unrelated performances, is that the overall musicianship of each child influenced all of the scores. This is not surprising given the subjective nature of the rating process.

Component C1/C2: Performance measures. The number of errors in the two-measure components (C1, C2) as played in the previously learned pieces did not correlate significantly with any of the other performances, the same components in the test pieces, or the slightly altered components (D1, D2). It is virtually impossible to draw any empirical conclusions about the relationship of the components C1 and C2 to the other components or test pieces because significant correlations were not found. There appeared to be no relation between the child's success at executing these phrases and the success with the components in other settings. Error analysis using group means was a more appropriate way to address the hypothesis of the C components having less errors than the D components. This analysis is discussed in conjunction with the observational data where interesting patterns in the errors between C1 and D1 and C2 and D2 were discovered suggesting that a relationship did exist that was not revealed by the dependent measures used in this study (see discussion of observational data). The surprising finding that the errors in the components as played in the previously learned pieces did not correlate with the performance of the same components in the test pieces

was likely because of the design of the test sessions. The unorthodox approach of obtaining an independent variable at the end of the session during which the 'treatment' had already occurred may have affected the overall results. By the time the children played their performances of the Song of the Wind and Minuet #2 they had encountered the lifted components (C1 and C2) many times. It is likely that their success with the components within the previously learned pieces were thus inflated. Had the previously learned pieces been played at the beginning of the session a similar practice effect may have occurred within the test pieces (although because there would not have been actual practice repetitions of the components, perhaps it would have been less pronounced).

Listening: Test pieces. Many of the expected relationships between background variables of the children and their performances on the test pieces were not supported in the context of this study. For example, the amount of listening to the test pieces did not correlate with the performance of these same pieces.

To allow for the possibility that listening effects were being confounded by the maturity or sight-reading abilities of the older group, four analyses of variance were conducted. They included the level of listening (summarized as low, medium, or high) and group membership as the independent variables and the error counts, and overall musical ratings of the two test pieces as the dependent variables. There was a significant effect of group on the number of errors in the 12-minute performances of both test pieces (F (1, 533) = 5.038, p <.04; F (1, 51) = 5.581, p <.03). There were no significant effects or interactions because of the level of listening. Thus, the older group had fewer errors in their 12-minute performances of both pieces, but the amount of listening was not a significant factor in the performances of either group.

The lack of correlation between all listening measures and performance measures was confusing because there were many indications in the video

observations that the participants often arrived with a clear idea of the pieces in their heads (see discussion of observational data). The most probable explanation for the difficulty in isolating a direct relationship between listening and performance in this study is the lack of detailed information about how the children listened at home. The information that was gathered provided details regarding the number of days that the children listened, the number of minutes on each of those days, whether the parent or child initiated the listening, the teacher's emphasis on listening, and the child's usual listening patterns. The parents were also questioned about the child's comments or behavior regarding the taped pieces. (Comments varied from "She loved it" to "She hated it," and seven children noted the familiar components as being from or similar to their Suzuki repertoire.) Information was limited regarding how carefully the child listened at home, and of course the amount of listening may have been reported by the parents or children inaccurately. Although it was expected that this information would assist in uncovering trends in listening and performance success in the test sessions, it did not.

Actual practice time and condition effects. The actual practice time (APT) did not correlate significantly with any of the performance measures, and the child's average amount of daily practice did not correlate with the amount of time spent on each piece during the test session. Furthermore, a repeated measures ANOVA revealed no significant effects on the overall practice time during the session because of either group or condition. (Recall that the condition determined the order in which the test pieces were presented and practiced.)

The actual practice time was investigated as both a dependent variable and an independent variable. Although the ANOVA revealed no significant difference in how much time was spent practicing by the two age groups during the test session, a closer examination of the means revealed that the book 4 group spent marginally longer practicing both pieces than the book 2 group. Likewise, the means revealed

that in conditions 1 and 2 (where The Maple Tree preceded The Birch Tree) less time was spent practicing overall with only a three second difference between the two pieces. Children in conditions 3 and 4 on the other hand, allocated 80 seconds more to The Birch Tree than to The Maple Tree and spent longer overall practicing (see Tables 6 and 7).

Table 6

Means for Total Practice Time by Group

	Group	
	2	4
Total practice time Maple tree	406 s (n = 10)	497 s (n = 9)
Total practice time Birch tree	436 s (n = 11)	562 s (n = 9)

Table 7

Means for Total Practice Time by Condition

	Condition	
	1 or 2	3 or 4
Total practice time Maple tree	432 s (n = 9)	465 s (n = 10)
Total practice time Birch tree	429 s (n = 9)	544 s (n = 11)

I assumed that the actual practice time (APT), as an independent variable, would correlate with the final performance measures; this was not the case. This finding coincided with the work of Wagner (as cited in Barry & McArthur, 1994), who found that although keeping a written report of practice time increased the overall practice time, the increase in practice time did not necessarily result in improved performance. This matter will be discussed further in the context of the observational data.

In a test of behavior, both accuracy and response time are often measured (Fiske, 1992). Because of the lack of correlation between APT and performance measures, I took a closer look at what relations did exist. The results indicate that with both test pieces the children with the five highest overall musical ratings spent less time practicing than did the children with the five lowest ratings (see Tables 8 and 9). It should be noted that the APT means would have been even lower for the high scoring group were it not for the 720 second scores contributed by the 'obedient' students. Obedient students are defined in the discussion of observational data. (These scores are in brackets in the tables.) At the risk of oversimplifying the image, these data are in keeping with the semantic network model, which suggests that not only are there strong connections in place when previously learned information is being called upon, but there is a difference in the speed of processing new information as well (Chi, 1978; Cutietta, 1985).

Although it is not surprising that there were more of the older children in the highest score group, and more of the younger children in the lower score group, what is interesting is that the reverse also occurred in six instances. In other words the highest and lowest scores did not necessarily correspond with the book level of the child.

Table 8

Highest and Lowest Musical Ratings and Corresponding Practice Times

Maple Tree	Highest raw scores (overall musical ratings)					M
Final performance	46.5	45.5	45.5	45	43.5	45.2
Total practice time (sec)	317	[720]	107	[720]	246	422
Group	2	4	4	4	2	

	Lowest raw scores (overall musical ratings)					M
Final performance	25.5	34	35.5	36.5	37	33.7
Total practice time (sec)	600	338	708	623	514	556.6
Group	2	2	2	4	4	

Birch Tree	Highest raw scores (overall musical ratings)					M
Final performance	48	46.5	46	45.5	45	46.2
Total practice time (sec)	256	[720]	249	[720]	260	441
Group	2	4	4	4	4	

	Lowest raw scores (overall musical ratings)					M
Final performance	25	27	28	30	32	28.4
Total practice time (sec)	492	374	314	710	420	462
Group	2	2	2	4	2	

Table 9

Highest and Lowest Error Counts and Corresponding Practice Times

Maple Tree	Lowest raw scores (less errors)					M
Final performance	0	0	0	0	1	.2
Total practice time (sec)	246	[720]	[720]	[720]	623	605.8
Group	2	4	4	4	4	

	Highest raw scores (more errors)					M
Final performance	16	7	4	5	3	7
Total practice time (sec)	600	338	708	465	450	512.2
Group	2	2	2	2	2	

Birch Tree	Lowest raw scores (less errors)					M
Final performance	0	0	0	0	2	.4
Total practice time (sec)	[720]	249	[720]	670	[720]	615.8
Group	4	4	4	4	2	

	Highest raw scores (more errors)					M
Final performance	52	30	10	15	7	22.8
Total practice time (sec)	420	374	318	492	291	379
Group	2	2	2	2	2	

Other Correlations

The questionnaire issued to the parents prior to the test sessions provided a large source of background variables for analysis. The following correlations were of the most interest to this study.

The frequency of group lesson attendance (on a scale where 1 = always) correlated with the number of errors in the 6-minute performances of both test pieces (TP1: $r = .4838$, $p < .031$, $N = 20$; TP2: $r = .6419$, $p < .002$, $N = 20$). Because group lessons are a common venue for the review of previous material, it is of interest that higher group attendance correlated with fewer errors in the test pieces. Statements about the violin teacher's emphasis on review and sight reading did not correlate meaningfully with any of the performance measures. The number of performances in which the child participated during the past year and the average amount of listening at home to Suzuki or classical recordings also did not correlate with any of the performance measures.

Age differences. There were surprisingly few correlations that indicated a relationship between the group level and the performance measures. Only 6 of 28 performance measures indicated that membership in the older group correlated with higher performance scores. Examination of the raw mean scores (see Tables 2, 3 and 4) confirmed that in this particular sample of students, maturity and experience did not always guarantee musical success.

Although they performed marginally better (with The Birch Tree in particular), the anticipated ceiling effects never surfaced for the older group, and all of the younger group managed to perform the test pieces in the one session. Several factors may have contributed to this.

1. The design and analysis of this study did not allow for deeper probing into possible differences in how the two groups approached the task of

learning the pieces (i.e., it was virtually impossible to discern good sight reading from familiarity with the music because of the prior listening).

2. Contrary to expectations, there was a great deal of similarity in the practice strategies across groups.

3. With the measures used, there was no way to differentiate between a slight error (one that the child instantly recognized and corrected) and a serious error (incorrect notes that were ignored or missed altogether).

4. The judges may have been influenced by age when giving the overall ratings (i.e., they may have expected more of older group).

5. The recency of the previously learned pieces for the younger group may have been to their advantage, because they were more likely to have played them recently in group classes or lessons (even though this was not reflected in the participants' estimates of when the pieces were last played).

Recency of the last playing of the previously learned pieces. Both the participants' and their parents' recall of when the previously learned pieces had last been played did not correlate significantly with each other or the child's performance of the PLPs or the test pieces during the test session, with two exceptions: The child's recall of last playing Minuet #2 correlated ($r = .5079$, $p < .03$, $N = 18$) with the number of errors in the session performance of that piece, and the parent's recall of the last performance of Song of the Wind correlated ($r = .6049$, $p < .01$, $N = 16$) with the number of errors in the child's performance of it during the session.

Although these two correlations indicated that the more days that had passed since the previously learned piece had been played, the more that errors were made, it should be noted that the interpretation of these correlations was undoubtedly marred by three factors.

1. The sample sizes were even lower than for other correlations because several children and parents could not guess when they had last played the pieces.

2. There were several outlying scores because of a few wild guesses by children. (For example, one child who had been studying for only four years suggested that it had been three years since the last playing of the piece.)

3. Minuet #2 was performed at a public concert by many of the participants in May 1996. This unfortunate coincidence substantially decreased the number of days since the last playing measure for several students who would not otherwise have played it.

Change in Performance Over Time: Effectiveness of the Second Practice Period:

Of interest in the observation of the practice sessions was the effectiveness of the participant's practicing. This was investigated by comparing whether or not there were significant changes in the participants' performances from the 6-minute mark to the 12-minute mark. A paired samples t-test was appropriate for this analysis because the sample size was under 30 (Gibson, 1994). Because of the strong possibility that the two age groups performed differently, independent t-tests by group were also performed using the difference of the error scores between the 6- and 12-minute performances and then the difference of the overall rating scores.

The results were mixed, although most showed no significant difference in scores from the 6-minute performance to the 12-minute performance. Performances of the The Maple Tree showed a significant mean decrease in errors of 2.05 when all participants were analyzed together (t (18) = 2.18; $p < .043$ two-tailed). The independent t-test between the book 2 group and the book 4 group revealed no significant difference between the two performances. The same t-tests using the overall musical ratings in place of error scores revealed no significant difference in scores across the two performances of The Maple Tree. The Birch Tree performances also revealed no statistical differences in the number of errors from

one performance to the next. The overall musical rating improved significantly for the book 4 group (t (17) = 3.08, p < .007), but the paired samples t-test once again indicated no significant change for the sample as a whole.

Although the t-tests indicated very little change from the 6-minute performance to the 12-minute performance, there are several factors that became evident in the examination of the means and frequencies of the difference scores, therefore, they have been included here (see Tables 10 and 11). The t-test provided correction for the regrettably small samples in these analyses, and the distribution of difference scores approached the normal distribution, but it was evident that the presence of several outlying scores skewed the outcome of the analyses. Because of the relatedness of the test scores a multivariate t-test was also tried. It revealed no significant effects. These data concurred with the observational data that very little improvement occurred as a result of the practicing that occurred after the 6-minute performance. Even the statistically significant improvement in The Maple Tree only reflected a decrease of two errors.

Table 10

Means and Frequencies of Difference Scores by Group: The Maple Tree

	Difference in errors from first to final performance* (M = 2)	Frequency		Difference in errors from first to final performance* (M = 2.1)	Frequency
Group 2	-1	4	Group 4	-3	1
	0	1		-1	1
	1	2		0	2
	2	1		1	1
	8	1		2	1
	12	1		5	2
	missing	1		10	1

* negative score indicates more errors in the second performance

	Difference in OMR from first to final performance* (M = - .85)	Frequency		Difference in OMR from first to final performance* (M = -2.61)	Frequency
Group 2	-7.5	1.0	Group 4	-14.5	1.0
	-5.5	1.0		-8.0	1.0
	-2.0	1.0		-2.5	2.0
	-1.0	1.0		-0.5	2.0
	-0.5	1.0		0.0	1.0
	0.0	1.0		0.5	1.0
	0.5	1.0		4.5	1.0
	1.5	1.0			
	2.0	1.0			
	4.0	1.0			
	missing	1.0			

* negative score indicates higher rating on the second performance

Table 11

Means and Frequencies of Difference Scores by Group: The Birch Tree

	Difference in errors from first to final performance* (M = -1.36)	Frequency		Difference in errors from first to final performance* (M = 6.89)	Frequency
Group 2	-20	1	Group 4	-5	1
	-3	1		0	3
	-1	2		1	1
	0	4		5	1
	2	1		6	1
	4	2		10	1
				45	1

* negative score indicates more errors in the second performance

	Difference in OMR from first to final performance* (M = .8)	Frequency		Difference in OMR from first to final performance* (M = -4.06)	Frequency
Group 2	-1.5	1.0	Group 4	-15.0	1.0
	-1.0	1.0		-6.5	1.0
	-0.5	2.0		-4.5	1.0
	0.0	1.0		-3.5	1.0
	1.5	1.0		-3.0	2.0
	2.0	2.0		-2.0	1.0
	2.5	1.0		0.5	2.0
	3.5	1.0			
	missing	1.0			

* negative score indicates higher rating on the second performance

Observational Data

One of the most interesting aspects of this study was the chance to observe hours of children's practice time on videotape. Probably every instrumental teacher has wondered what actually goes on between lessons. A primary concern for parents of music students is what and how to practice with their children to minimize frustration in the music learning process (Barry & McArthur, 1994).

Although it was obvious that the testing situation differed in many ways from the participant's natural home-practice environment, the session length was usually similar to a regular practice session at home. There were several striking similarities in how all 20 participants worked towards the goal of performing the test pieces.

Practice Strategies

General. It is a common practice to code participants' behavior in an experimental setting in an effort to categorize or identify trends for further investigation (M. Bouffard & S. Romanow, personal communication, October 20, 1995; R. Duke, personal communication, August 12, 1995; Gruson, 1988). These codes have also been identified as strategies (Barry, 1992; Barrett, 1990). The word strategy is used loosely here to describe behaviors observed in this study that occurred with enough frequency or confidence to elicit comment.

The 'back to the beginning, over and over again' strategy. The primary strategy used by all participants while acquiring the new pieces was best described as the 'back to the beginning, over and over again' strategy. The student played through the entire piece (or occasionally half of the piece), slowing down in difficult parts but always continuing to the end and then starting over again. Usually, this process was repeated with virtually no time between repetitions until the child became fatigued, at which point there might be a slight pause between repetitions. In general (and in keeping with Gruson [1988]), when a wrong note

was played and noted, the child immediately repeated the note in question. On rare occasions the entire phrase was repeated, but usually, if the child played more than the specific note, the strategy was to return all the way to the beginning of the piece. This strategy was identified by Sloboda (1985) and was also reported by Barry (1992) as the most common response when Grade 7 to Grade 9 students were asked about their usual type of practicing. The original hypothesis that children would allocate more time to the new material in the test pieces and less to the familiar components was not supported by these data because of the participants' tendency to play everything over and over again.

The 'silent fingering' strategy. Although the 'back to the beginning, over and over again' strategy dominated the practice sessions, there was evidence of other common strategies. Six children (four from group 4 and two from group 2) studied the music while silently fingering the notes on their violins in the early stages of acquisition. One student (who actively used many strategies throughout the practice sessions) attempted to bow the pieces silently in the air. This 'silent fingering' strategy coincides with the concept of mental practice, which was shown to be very effective in conjunction with physical practice in a study of trombonists by Ross (1985). This strategy was also reported by Barry (1985) as being self-reported by students, but usually observed only in structured practice sessions.

The 'looking away, memorization' strategy. Another obvious strategy (used primarily by the older group) was the memorization strategy of deliberately looking or turning away from the music to determine if the piece was indeed memorized. Surprisingly, 14 students (including most of the younger group) did not use this overt method of trying to memorize the pieces. Those who did use this strategy did not usually do so until after the 6-minute performance of each test piece. For many students this was the only strategy used aside from the back to the beginning strategy.

The 'slow down only when necessary' strategy. Although one student played through the test pieces quite slowly on the first playing, the remaining children started almost at performance tempo and slowed down only in difficult passages. All of the students, (even those who had many errors in the pieces), played many repetitions of the pieces at full performance tempo (or faster!) throughout the practice session. Occasionally an older student slowed down in the face of extreme problems, but the younger students slowed only when the passage simply could not be played. Several children actually made a point of playing the easier parts particularly quickly as if to get to the difficult parts faster. They would then slow down during the difficult passages. Choosing faster tempi was also a characteristic of the free-practice wind players in Barry's (1992) study.

This habit of slowing down and speeding up, although so common as to be overlooked by the parent or teacher accustomed to hearing children practice, could be a window to the internal processing of new repertoire. Recall that according to Clarke (1985), the internal schemata (he suggested a hierarchical structure) for a memorized performance would have to exist prior to the performance even if only parts of it were activated at any one time. To support this notion he stated: "It has been demonstrated by many authors that complex motor skills cannot achieve fluency and accuracy if they do not develop the hierarchical structures of motor programmes" (p.7). He cited Shaffer (1976), who showed that without advance information a copy typist resorted to low speed and fluency. It certainly appears that the situation was the same for young violinists.

General Observations

Confusion of components. In the discussion of the statistical analysis reference was made to a part of the original hypothesis that was not supported by the empirical data but was apparent in the observational data. There were no statistically significant relationships between the familiar components C1 and C2 as

performed in the PLPs, C1 and C2 in their related test pieces, and the unfamiliar components D1 and D2. Closer inspection of the type of errors made specifically in the components during the final performances, however, painted a different picture. In 24 of 39 performances of The Maple Tree, the errors counted included errors stemming from direct confusion of C1 and D1. The same situation arose with C2 and D2 in 21 of 39 performances of The Birch Tree. Not only did students replace the unfamiliar D1 or D2 with the familiar C1 and C2 in 24 cases, but they also replaced the familiar components C1 and C2 with the unfamiliar D1 and D2 on 21 occasions. Thus, although the empirical data did not support the original hypothesis, the observations certainly indicated a definite link in the processing. It was unclear at what point in the acquisition process the interference of the two components took place. In one or both test pieces, 12 students played one of the two components consistently across the board, apparently oblivious to the differences. Other students attempted to sort out the components separately but then confused them again over time. Only two students (in the book 4 group) played all of the different components in the correct places. Clearly, the confusion between the familiar and the slightly altered components was a major contributor to the error counts.

Almost half of the confusion errors involved replacing the familiar components with the unfamiliar components. The obvious question in this situation was, Why not take the path of least resistance? Intuitively, one might suspect that the attentional demands of learning the different component 'blocked out' the familiar component. This position has found some support in the knowledge-base literature dealing with the use of analogy when no prior knowledge is available for activation. An instructional paradigm that incorporated texts classified as near or far from the to-be-learned domain of science showed superior recall for material presented with far-domain analogies (Halpern, Hanson, & Riefer, 1990). This

somewhat surprising result was justified with the interpretation that the salience of the surface similarity of the near-domain text required less effortful processing than the far-domain text did and was therefore less memorable. A similar explanation could be applied to this musical situation.

Errors in the new material compared to errors in the familiar material. One of the original hypotheses stated that participants would spend more time studying the new surrounding material than the familiar components. Because they appeared to allocate the same number of repetitions to everything, time did not turn out to be the best way to examine the processing that was occurring. Error analysis indicated, however, that errors on the components were almost always reversals of C1 and D1 (as opposed to random general errors), and most other general errors occurred in the surrounding new material. This is of interest because the new material was technically simpler than the components. The lack of general errors in the components and the presence of general errors in the surrounding material therefore supported the hypothesis.

A more detailed analysis of the errors in the specific components was required to address the hypothesis that less errors would be made in the familiar components than in the unfamiliar components. Comparison of mean errors for each component by group indicated that this was not always the case (see Table 12). Both groups had slightly more errors in C1 than D1 when the 6 min and 12 min performances were combined. In the more complex test piece, however, the younger group averaged 2.3 less errors on C2 than on D2 but the older group still had slightly more errors on C2. (It could be argued for both test pieces that there was a negligible difference between errors in the two components for the older group).

Table 12

Mean Errors in Components by Group

	The Maple Tree: Errors					
	C1 (6)	D1 (6)	C1 (12)	D1 (12)	Total C1	Total D1
Group 2	2.3	1.6	1.4	1.4	3.7	3.0
Group 4	0.7	0.9	0.5	0.2	1.2	1.1
	The Birch Tree: Errors					
	C2 (6)	D2 (6)	C2 (12)	D2 (12)	Total C2	Total D2
Group 2	1.9	3.1	2.1	3.2	4.0	6.3
Group 4	2.6	2.1	0.6	0.9	3.2	3.0

C1 = familiar component (The Maple Tree) / C2 = familiar component (The Birch Tree)
D1 = unfamiliar component (The Maple Tree) / D2 = unfamiliar component (The Birch Tree)
(6) = 6 min performance / (12) = 12 min performance

In light of the strong confusion factor just discussed a cognitive link between the previously learned material of component C and the final performances cannot be dismissed. Even more important, perhaps, is the difference in errors in relation to the difficulty of the test piece. The Birch Tree was more challenging, particularly for the younger group and it was in this piece that the previously learned component was performed with less errors than the new component. As will be discussed in Chapter 5, these questions need to be investigated with test pieces of varying levels of difficulty.

Impact of listening on performance. In both age groups there was strong evidence that the melodies of the pieces were firmly embedded in the 'ears' of the students before they arrived at the session. Although this observation was not supported by the empirical data relating the amount of listening and subsequent performance, there were several behavioral indicators of previous listening that should not be disregarded.

One indication of previous listening was the immediate gravitation toward performance tempo and accurate rhythm even on the first playing of the piece. It was clear that many of the children had limited sight-reading ability (as indicated by the difficulty in using the printed music as a tool, which will be discussed presently), but there was never a problem with the rhythmic accuracy of the pieces, with two notable exceptions. Before elaborating on the exceptions I will examine an alternate explanation for this rhythmic accuracy. Sloboda and Parker (1985) reported an experiment in which participants were asked to sing back melodies after hearing them played six times on the piano. They noted that "the most fundamental feature that is preserved in this melody is the metrical structure. . . . This suggests that meter is a primary structural frame for melodic comprehension and recall" (p.159).

The two notable rhythmic errors made by the young violinists in this study offered strong evidence that aural processing had preceded the sight reading. Nine of the students tied together the two notes in either the first, third, or both measures of The Birch Tree (see Figures 9 and 10). Because there was no indication in the printed music that there should be any slurring or connection of these notes, I checked the recording of the piece to which the children had been listening. It appeared that the reverberation of the same note repeated on the recording gave the impression of one longer note to many of the children. Seven of the nine children were in the younger group, indicating a stronger reliance on ear over eye in this age group. Students who played either of these passages with this rhythmic error inevitably played it that way from the very beginning, and only one student (from the older group) caught the error and corrected it as a result of having the printed music available as a reference. Such strong listening effects certainly indicate that care must be taken in providing accurate aural models for students.

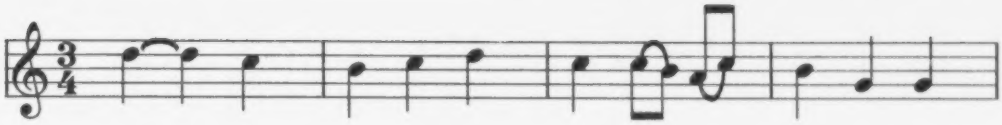

Figure 9. Error 1 (The Birch Tree).

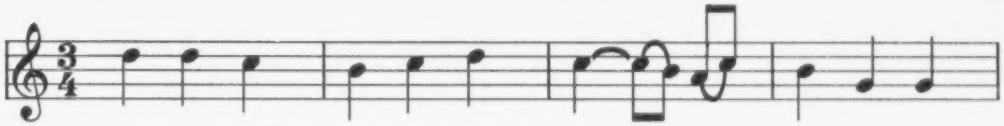

Figure 10. Error 2 (The Birch Tree).

Use of the printed music. This leads directly into the next group of observations, which all related to the use of the printed music as a tool during the practice sessions. All of the participants looked at the music stand at least periodically. In fact, the most common behavior when the child was unsure of something was to lean towards the music stand to look more closely at the music. This behavior was particularly interesting because there were several children who did not appear to be helped by the printed music despite such careful perusal. Indeed, the efficacy of having the music in front of some of the students was questionable. Several observations led me to this conclusion. In addition to the uncorrected rhythmic errors just discussed, another indication of the limited way the students used the printed music as a tool was the common disregard for suggested fingerings and bowings. Often, even if a child could play the notes perfectly very early in the practice period and continued to look at the music, there was no adjustment of incorrect fingerings or bowings as long as the piece sounded accurate. Twelve of the children made little or no attempt to follow the suggested bowings or fingerings in the test pieces. Furthermore, (a) 11 children made no

changes to their initial errors even after watching the music throughout the practice sessions; (b) a few children appeared to become more confused if they studied the music, and only a couple of the older students seemed to use the music to focus directly on difficult passages without starting from the beginning; (c) when the passage was difficult, the child did not appear to be helped by the notation at all, but rather engaged in a trial-and-error process, staring at the music until the passage sounded passable; (d) error patterns often indicated a tendency by the children to jump ahead or lose their place in the music as if there was a tracking problem quite separate from deciphering the notes; and (e) when a child played incorrect notes he or she was often a third above or below the printed note, which is a common sight-reading error.

For the instrumental teacher these findings indicate that more emphasis in teaching sight reading needs to be on the use of editorial markings in the music, so that the student and parent understand the potential use of the printed music for information other than simply correct notes. Furthermore, the skill of being able to locate problem spots in the printed music without starting from the beginning should be developed.

Actual practice time as a dependent variable. The choices made by the students regarding the actual time spent practicing the test pieces fell into the following categories: (a) prudent (needed all the time and used it), (b) overconfident (needed all the time but did not use it), (c) obedient (did not need all the time but used it because instructed to), and (d) confident (did not need all the time and did not use it).

It is debatable whether (c) or (d) should be considered the higher level strategy because (d) appeared to be more efficient and indicated independence on the part of the child. C-style behavior, however, would be considered a better strategy in the perfection of musical skill because perfect performances under

pressure or over time often require a high degree of overlearning (Ericsson et al.; as cited in Davidson, Sloboda & Howe, 1995/96; Gruson, 1988; Singer, 1980; Sloboda & Howe, 1995/96). In this particular context, however, although the participants may have made immature or uninformed decisions about the allotment of practice time, for many of them it was as if they possessed a self-regulatory measure of how much practice was needed to accomplish only the basic goal of "getting through" the test pieces. As discussed earlier, the most interesting finding was that children with the highest performance ratings accomplished those performances with less practice time (excepting those in the obedient category who used the full allotted time), than the children with the lowest ratings.

Self-direction. All of these students had a Suzuki background. Because one characteristic of the Suzuki method is an emphasis on parental involvement in lessons and practicing, it was not surprising that most children in the younger group exhibited a need or desire for guidance during the practice session. (Seven of the 11 children in this group looked regularly to the assistant for an indication of whether to continue practicing or not.) It was evident from the questionnaire responses, however, that the older group of students were all practicing more without parental assistance. Not surprisingly, they were more independent in the practice sessions, and yet their overall practice style of simply playing the test pieces over and over again from the beginning did not differ dramatically from that of the younger group. In fact, the final performance results were not remarkably different between the groups. The practice style of the older students did not exhibit a marked difference in the approach to or breakdown of the problem of learning a new piece. This indicates that the practice habits that were established in the early years lingered even with cognitive maturation.

The initial reaction to these observations might be to assume that parental involvement has been producing poor independent practicers. It is important to

note, however, that musical success has been repeatedly related to parental involvement (Applebaum; as cited in Wickes, 1982; Barry & McArthur, 1994; Davidson et al., 1995/96; Zdzinski, 1996). Perhaps the important note for teachers is that parents may need very specific guidance in how to assist the child in pursuing musical goals in the very first years of study, so that productive habits may be developed before the 'weaning process' is completed.

Diligence and fatigue. Most of the students exhibited admirable diligence in the practice sessions. Although one or two entered into casual conversation with the assistant, most remained seriously on task and seldom stopped playing. Many showed physical signs of fatigue by occasionally rolling their shoulders or necks, but none of the students actually set down the instrument to rest or stretch until the assistant suggested it. Although undoubtedly this was an artificial situation and the practice behavior at home could be considerably less intense, it is worth consideration by parents and teachers that the development of good practice habits should include an awareness of when a brief rest outweighs the benefits of yet another repetition. To an adult observer it was also apparent that the insistence on numerous repetitions without a break was detrimental to the children who were having difficulty with certain passages, because there was no reflection time in between repetitions. I suspected that this behavior in the early stages of acquisition contributed largely to the 'setting' of some errors.

Final thoughts and suggestions. With errors not being corrected, even when the printed music was available, it became evident that once a mistake was played several times in a row, it was usually there for good. This fact, although clearly not revolutionary (Radocy & Boyle, 1988) was perhaps the most striking finding in these practice sessions and was supported by the results of the paired and independent t-tests, which showed no significant change in errors or overall performance from the 6-minute performance to the 12-minute performance. Barrett

(1990) described the evolution of children's 'best guesses' when trying to figure out musical patterns. She suggested:

> "Sometimes these best guesses evolved into more song-specific answers, but served their immediate purpose by creating musical context in the problem space. In other cases, plausible solutions were rehearsed so many times that they became resistant to modification and continued to be used throughout subsequent trials. Perhaps these solutions came to represent the subject's altered version of the target template as the strength of the recalled song faded" (p. 158).

Watching the students learn the errors at least as efficiently as the correct notes was enlightening. It could be bad news for teachers, parents, and students to imagine that errors played in the first five minutes of the first practice day of the week could be thoroughly mastered by the lesson seven days later! Clearly, the importance of carefully monitored practicing is supported by these data. Care in practice is not a new concept. The famous violin teacher Leopold Auer (as cited in Wickes, 1982) wrote: ."When they practice without observing and criticizing themselves they merely develop and perfect their faults. They are worse than wasting their time"(p.38). Another famous pedagogue, Ivan Galamian (as cited in Wickes, 1982), was more direct regarding the development of musical artists:

> "In practically each case, the practicing was constantly supervised either by the teacher or an assistant to the teacher. The lesson is not all. Children do not know how to work alone. The teacher must constantly teach the child how to practice."(p. 38).

"Music students must practice to achieve musical growth and progress, but not all practice is effective" (Barry & McArthur, 1994, p.53). Certainly, the findings of this opportunity to witness the practice processes of 20 children concurred with these statements. Teachers need to work with both the children and parents from the beginning to establish efficient practice routines. Especially in the case of the older child, a parent forced to choose which days to assist with practicing should ensure that it is the first practice after the lesson so that appropriate strategies and correct notes are solidified before the repetitions begin. A

further lesson for parents and teachers may be that students need to understand or be reminded of the long-term reality and goals of music acquisition so as not to be blinded by the relatively short-term goal of just learning the notes:

> "Thus it appears to be the many hours of practicing involved in mastering a new music level rather than the relatively few sessions it takes to learn an individual piece that bring about consistent and enduring changes in information processing" (Gruson, 1988, p. 107).

CHAPTER 5

Summary of Findings

It would be premature, on the basis of this research, to theorize about the general cognitive underpinnings of young violinists' music acquisition or practicing. Many of the results, however, confirm earlier research findings, and most promise future research. Witnessing the accomplishment of the younger group in learning the test pieces within such a short time period confirmed my interest in the musical processing of these very young 'experts'. A great deal of knowledge (procedural, cognitive, and motor skill) was in place at this young age that allowed for the complex task of deciphering and then accurately performing two new pieces of music without adult assistance.

I originally sought to examine the effect that previously learned repertoire had on the acquisition of new music. Although the overall musical ratings of the previously learned pieces were correlated with the overall ratings of the corresponding test pieces, these findings must be interpreted with caution. Overall musical ratings tended to correlate with many other measures as well, suggesting overall trends in the children's performances on all measures. More important psychologically was the common confusion of the familiar and unfamiliar components in the test pieces. A large proportion of the errors made by participants were related to switching the two components. This confirmed the hypothesis that there was interference associated with learning a phrase that was slightly altered from a previously learned phrase.

The amount of advance listening was not related statistically to any of the performance measures, but there was strong evidence in the observational data that children of both ages arrived with a set idea of the piece in their minds. This was

inferred from the consistent rhythmic errors made in one of the test pieces that matched the unintended reverberation on the recording.

The children were classified into four categories depicting their personal criteria for total amount of practice time: confident, overconfident, prudent, and obedient. More practicing did not ensure higher performance scores. In fact, the students with the top five overall musical ratings in each piece also had among the lowest total practice times (with the exception of students who fell into the obedient category and practiced the full time). Students with the lowest five scores practiced for longer times. These findings indicate an increase in speed as well as accuracy of processing for successful students.

There were, surprisingly, few differences between the two age groups. Older participants practiced only marginally more than the younger students, and their practice strategies were very similar. The main strategies identified were (a) back to the beginning, over and over again, (b) looking away, memorization, (c) the silent fingering, and (d) the slow down only when necessary.

One of the most interesting findings was the lack of improvement from 6-minute performances to 12-minute performances, which indicated that the second practice session for each test piece was not effective. One possible explanation for the lack of practice effect was inefficient use of the printed music as a tool. Both age groups consistently missed suggested fingerings and bowings, and once an error was 'set' it was rarely corrected. Although all of the children watched the music during the sessions, there were many indications that the music was not being used effectively in the practice process.

Most of the participants remained diligently on task throughout the sessions, although many felt that they did not need the full 12 minutes to practice. The younger students in particular appeared to want adult guidance during the sessions.

Several suggestions to parents and teachers about practicing were made as a result of these observations.

Recommendations for Future Research

The empirical evidence for knowledge-base effects was not strong in this study. The observational evidence, however, revealed several potential questions for further research. Rather than abandoning the hypothesis altogether, I am optimistic that an improved design could provide enlightening information.

Many of the questions asked could not be answered satisfactorily because of the small sample size. It would be beneficial to try again with many more participants of various ages who could be observed over multiple sessions. Further consideration of the test pieces could produce better examples of previously learned and altered components.

Since differences in performance between the two age groups were more pronounced with the more complex Birch Tree than The Maple Tree it can be assumed that test pieces that simulate the difficulty of the participants' current playing level would also provide better information about the acquisition of new repertoire when the student is challenged musically and technically.

Ideally, more information about how well the previously learned material was played by the students in the first place could be crucial in drawing conclusions about the benefits of review. A longitudinal study which follows the progress of many students with periodic video sessions as they progress through the repertoire would be an ideal design.

In an attempt to clarify some of the speculation about whether the participants were sight-reading or working by ear, I would like to replicate this study with four test pieces. The first would contain the familiar component, and the participants would listen in advance of the session. The second would not contain any familiar components, and the participants would listen to it in advance of the

session. The third and fourth pieces would contain or not contain familiar components, respectively, but the participants would not listen to these pieces in advance of the session. Depending on sample availability, this study would have to include either many students with one or two pieces and one session or fewer students who would eventually play all four pieces over four extended sessions.

Further examination of how students use the printed music during practice is also called for. In particular, more information about participants' sight reading background would allow for a design that incorporated this factor as a controlled independent variable so that the use of music as a practice strategy could be investigated in more detail.

Conclusion

There is no doubt that a child's overall musical success will always be attributable to many factors, such as parental support and involvement, exposure to good music, performance opportunities, and good teaching, to mention just a few. The more we can discover about the acquisition, practice, and internalization of the music that they are learning, however, the more we can delineate what teachers and parents need to emphasize to maximize every child's success. Even more important, perhaps such discoveries will also begin to inform our knowledge of general cognitive processing.

It has been suggested in the context of academic skills that a reciprocity between developmental psychology and assessment research can only exist with the presence of researchers with expertise in both domains (Bisanz & Bisanz, 1994). The gap between scientific inquiry and the arts looms even larger. "The level of theoretical and empirical sophistication demanded by the arts may well be greater than that required in any other area, and our current explanations are only just beginning to scratch the surface" (Hargreaves, 1986, p. 227). With the

collaboration of psychologists, musicians, and educators, there is unlimited potential for the education of all children.

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Appendix A

Consent Form

Processes involved in the music learning of Suzuki violinists
(Elizabeth Jones Cherwick - University of Alberta)

CONSENT FORM

Child's name: _____ **Birth date:** ___ / ___ / ___
D M Y

Newest Piece: _____ **(Suzuki book:)**

Parent / Guardian: _____

Phone: _____ **(day)** _____ **(p.m.)**

Address: _____ **(street)**

_____ **(city)**

_____ **(code)**

I have read the attached information and give my consent for
_____ **(please print child's name) to participate in the study *Processes involved in the music learning of Suzuki violinists.***

_____ _____

(Signature of Parent or Guardian) **(Date)**

{Please mail in provided envelope by May 18, 1996}

Appendix B

Questionnaire

Questionnaire 1

Processes involved in the music learning of Suzuki violinists

QUESTIONNAIRE

This questionnaire will provide background information for the study your child is participating in. It is for research purposes only and you, your child and your child's teacher are in no way being evaluated. The names of participants will be coded and all information will be confidential. Please complete the questionnaire and bring it to the test session.

• Child's Name: _____ • Parent's Name: _____

• Sex: F M • Phone #: _____

• Birth date: / /
Y M D

• Child's school: _____ • Current school grade: _____

• Siblings in the household also studying music? Yes No

If Yes:
• Sibling #1 _____ (age) _____ (instrument)
• Sibling #2 _____ (age) _____ (instrument)
• Sibling #3 _____ (age) _____ (instrument)
• Sibling #4 _____ (age) _____ (instrument)

• We began violin studies: _____ / _____
(month) (year)

• We have studied with other violin teachers prior to our current teacher: Yes No

If Yes please specify the number of years spent with each teacher and whether the teacher was a Suzuki teacher or a traditional teacher:

•Teacher #1: _____yr(s) Suzuki Traditional
•Teacher #2: _____yr(s) Suzuki Traditional
•Teacher #3: _____yr(s) Suzuki Traditional
•Current teacher: _____yr(s)

• Newest piece: _____ _____ _____
(title) (composer) (Book #)

• My child has performed approximately _____ times during the past 12 month period. (Please include participation in solo recitals, group concerts, festivals, orchestra, community, family or school performances.)

Questionnaire 2

- My child has studied all the pieces in the Suzuki repertoire up to the current piece.
  Yes No

If No please list pieces that were not studied:_____
_____
_____
_____

- Non-Suzuki repertoire my child has studied:_____
_____
_____
_____

Please indicate your usual situation:

- On average, my child practices _____ days / week.
- A parent is present during practicing _____ days / week.
- On average, practice sessions last for _____ minutes.
- On average, Suzuki recordings are played _____ minutes/week.
- On average, other classical music is played _____ minutes/week.

- Usually practice sessions are broken down as follows:
  (please indicate percentage of overall practice time)

Newest piece:	_____%
Exercises (technical / preview):	_____%
Review pieces:	_____%
Sight-reading:	_____%
Other:	_____%
Total:	100 %

- Please indicate how review pieces are usually practiced:

Violin alone:	_____%		
With live accompaniment:	_____%	With parent:	_____%
With accompaniment tape:	_____%	Without parent:	_____%
Total:	100 %	Total:	100 %

- Please indicate how the newest piece is usually practiced:

Parent assists with piano:	_____%
Parent assists with violin:	_____%
Parent assists verbally:	_____%
Child works unassisted:	_____%
Total:	100 %

Questionnaire 3

• Please rate the following statements by circling the appropriate response using the following as a guideline:

1 = always 2 = frequently 3 = occasionally 4 = never

Our teacher emphasizes:

listening.	1	2	3	4
daily practice	1	2	3	4
sight reading	1	2	3	4
review	1	2	3	4
playing with the recording	1	2	3	4
improvisation	1	2	3	4
group class attendance	1	2	3	4
repetition	1	2	3	4
memorization	1	2	3	4
performing regularly	1	2	3	4

Please circle the responses that apply:

• My child plays in an orchestra. Yes No

• My child is involved in music at school. Yes No

If Yes:

In-class instruction:	Yes	No	instrumental	vocal
Extracurricular:	Yes	No	instrumental	vocal

• My child attends Suzuki group lessons.

always (19-20/20 group lessons) frequently (14-18/20 group lessons) occasionally (1-13/20 group lessons) never (0 group lessons)

• A parent attends group lessons with the child.

always (19-20/20 group lessons) frequently (14-18/20 group lessons) occasionally (1-13/20 group lessons) never (0 group lessons)

• My child attends weekly private lessons. Yes No

• A parent attends private lessons with the child.

always (38-40/40 lessons) frequently (30-37/40 lessons) occasionally (1-29/40 lessons) never (0 lessons)

Thank you for your time.

Please return this questionnaire to the researcher at your scheduled test session.

Appendix C

Listening Chart

LISTENING CHART

NAME: _____

Please put a sticker on each day that you listen to the entire 10 minutes of music on the study tape. You do not need to sit still and just listen. You may let the tape play in the background while you ride in the car, do homework, play, make your bed etc.. If you listen less or more than the 10 minutes please mark the total number of minutes you think you listened on the calendar. If you bring this chart to your video session with at least 10 stickers on it you will get a prize! Please begin listening approximately two weeks prior to your test session date. (i.e. If your session is on Friday, June 21, begin listening on Friday, June 7.)

June 1996

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5 (received tape)	6	7	8
9	10	11	12	13	14	15
16	17	18	19 (test sessions)	20	21 (test sessions)	22 (test sessions)
23 (test sessions)	24	25	26	27	28	29

Appendix D

Overall Musical Rating: Raters' Form

		Maple Tree 6	Maple Tree 12	Birch Tree 6	Birch Tree 12	Song of Wind	Minuet #2
TEMPO	inconsistent; inappropriate						
	inconsistent but appropriate						
	consistent but inappropriate						
	consistent; appropriate						
RHYTHM	4 or more errors						
	1 - 3 errors						
	accurate but clipped						
	accurate						
WRONG NOTES (doesn't include missed notes)	10 or more wrong notes						
	4 - 9 wrong notes						
	1 - 3 wrong notes						
	0 wrong notes						
FINGERINGS (departure from suggested)	10 or more departures						
	5 - 9 departures						
	1-4 departures (i.e. 0 for 4th)						
	always uses sugg. fing.						
BOWINGS (departure from suggested)	10 or more departures						
	5 - 9 departures						
	1 - 4 departures						
	always uses sugg. bowings						
REPEATED ATTEMPTS (false starts)	4 or more false starts						
	2 - 3 false starts						
	1 false start						
	0 false starts						
INTONATION	poor; no attempt to adjust						
	mediocre; attempts to adjust						
	good; quick to adjust						
	excellent; no need to adjust						

		Maple Tree 6	Maple Tree 12	Birch Tree 6	Birch Tree 12	Song of Wind	Minuet #2
TONE	poor						
(strength &	mediocre						
resonance)	good						
	excellent						
POSTURE	poor						
(body;	mediocre						
violin hold)	good						
	excellent						
BOW	poor						
CONTROL	mediocre						
(articulation)	good						
	excellent						
CONTINUITY	poor						
(phrasing;	mediocre						
hesitations)	good						
	excellent						
MEMORY	4 or more lapses						
	2 - 3 lapses						
	1 lapse						
	0 lapses						
MUSICALITY	no attempt						
(dynamics,	little attempt						
vibrato,	some attempt						
flair)	good attempt						

CURRICULUM VITAE

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EDUCATION

1991-1996

-graduate student in the Department of Educational Psychology, University of Alberta, Edmonton, Alberta

1990-1991

-special student in the Department of Psychology, University of Alberta, Edmonton, Alberta

1987

-first Canadian violinist to graduate from the Talent Education Institute, Matsumoto,Japan

1986

-graduated with Greatest Distinction from Brandon University, Brandon, Manitoba (Bachelor of Music (4 yr.), performance program)
-represented the graduating class as valedictorian
-received Lieutenant Governor's Gold Medal for the highest grade point average in the graduating year
-received Brandon University Gold and Silver Medals for the highest standing in the final two years at the School of Music
-received the Arthur and Abbie Vining Memorial Graduate Scholarship for further studies

1982-1986

-held numerous performance and academic scholarships at Brandon University including highest-standing music scholarships each year, R.D. Bell String Scholarships and several Eckhardt-Gramatté Memorial performance scholarships

1982

-graduated from Saunders Secondary School, London, Ontario as Ontario Scholar
-received numerous academic and music awards throughout high school

MUSICAL EXPERIENCE AND HONOURS

-private violin teachers and coaches have included: Dr. Francis Chaplin, Franco Gulli, Gulli/Cavallo Duo, Robert Skelton, Victor Martin, Gwen Thompson, Maurice Clare, Milton Goldberg, William Starr and Dr. Shinichi Suzuki
-performed the first movement of the Tchaikovsky Violin Concerto with the Berlin Symphony Orchestra, Berlin, Germany (1987)
-performed frequently as soloist and ensemble player in Matsumoto, Japan (1986-1987)
-performed in several recitals in Marseille and St. Véran, France (1987-1988)
-winner of the Young Artists Series competition resulting in a 16-centre concert tour of Western Canada (1983)
-finalist in the Canadian Federation of Music Teachers' Association Concerto Competition, Vancouver, B.C. (1985)
-string representative for Manitoba at the National Music Festival finals in Winnipeg, Manitoba (1983).
-soloist with the Brandon University Orchestra, Brandon, Manitoba (1983,1984)
-soloist with the London Youth Symphony Orchestra, London, Ontario (1981,1982)
-frequent performer in recitals and on television in London, Brandon, and Winnipeg (1975-1986)
-12 years private piano instruction (frequent accompanist for students)
-3 years trumpet instruction
-2 years private vocal instruction and member of numerous choral ensembles including the Brandon University Chorale and "Madrigalia" (a small madrigal group), Brandon, Manitoba

Orchestral experience includes:

-2 seasons with the National Youth Orchestra of Canada (1981, 1982)
-5 seasons (3 as concertmaster) with the London Youth Symphony Orchestra (1977-1982)
-4 seasons (principal second (1), co-concertmaster (1), and concertmaster (2)) with the Brandon University Orchestra (1982-1986)
-performances with the Regina Symphony Orchestra (1982) and the University of Western Ontario Orchestra (1981)
-numerous chamber music experiences (duos, trios, quartets, quintets, and baroque orchestra) including the London Sinfonia da Camera, London, Ontario (1981-82) and the Academy of Chamber Music in Banff, Alberta (1983)
-extensive experience with orchestral accompaniments for large choral works (ie. Mozart Requiem with Winnipeg Symphony in 1986)
-extensive experience playing in Operetta and broadway musical pit orchestras (concertmaster for "Anne of Green Gables", Edmonton, Alberta (1991))

TEACHING AND WORK EXPERIENCE

-Bilingual (English/French); some knowledge of Japanese and Ukrainian
-19 years of private and group violin teaching experience (frequent clinician at workshops across Canada and in the United States)
-currently teaching and managing own Suzuki violin studio; (on faculty of Alberta College, Conservatory of Music, Edmonton, AB)
-recently elected to serve on the board of the Suzuki Association of the Americas
-author of several articles including: "The Psychology of Suzuki: Reflections on the Psychological Implications of Dr. Shinichi Suzuki's Talent Education" published in the *American Suzuki Journal.(vol. 22, #4)*
-presented paper: "Research in Early Childhood Music Education" at the Suzuki Association of the Americas Teachers' Conference, Chicago, Illinois (June, 1994)

1991-1994
-Artistic Coordinator of the Society for Talent Education, Edmonton, Alberta
-Director of the 1993 Edmonton Suzuki String Institute, Edmonton, Alberta
-taught violin students of all levels at the Society for Talent Education, Edmonton, Alberta

1990-1991
-teacher for the Society for Talent Education, Edmonton, Alberta
-research assistant in linguistics lab while studying psychology at the University of Alberta, Edmonton, Alberta

1989-1990
-associate teacher in the Conservatory Department at Brandon University, Brandon, Manitoba
-Head Librarian at St. Vladimir's College, Roblin, Manitoba
-member of the Parkland Arts Festival Committee, Roblin, Manitoba

1988-1989
-Reporter/Photographer for the "Roblin Review", Roblin, Manitoba

1987-1988
-musical director of École de Musique Suzuki de Marseille, Marseille, France

1986-1987
-worked as English language teacher in Matsumoto, Japan

1978-1986
-taught violin students at all levels of musical development in London, Ontario, and with the Conservatory of Music at Brandon University, Brandon, Manitoba